RAILROAD GAZETTE

FRIDAY, NOVEMBER 9.

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Contributions.

A Fast Run in the West.

TO THE EDITOR OF THE RAILROAD GAZETTE:

You have mentioned a good run made Nov. 4 by a special train from Chicago to Indianapolis by the Louisville, New Albany & Chicago route. As fast runs are now getting much attention a further account of this performance may not be without interest to your readers.

The train consisted of engine No. 21, tender and one 60 ft. coach conveying copies of the Sunday issue of the Chicago *Inter-Ocean*. It is claimed that this is the fastest run ever made in the West. The longest stoppage appears to have been one of five minutes made at Monon, where several pouches of newspapers were transferred to a special train running in connection to Lafayette. The speed attained, including stoppages, was as follows.

Distance. Miles.		Time. h. m.	Speed.	Remarks.
183	Chicago—Indianapolis	4.32	40.	
163	Hammond—Indianapolis	3.39½	44.6	
95	Monon—Indianapolis	2.7½	44.7	
68	Hammond—Monon	1.27	46.9	Two intermediate stops for water.

The speed between Chicago and Hammond was necessarily slow on account of the numerous grade crossings, no less than 52 minutes being consumed in running the 20 miles. Very high speeds were attained on portions of the route, and it is claimed that Frankfort to Kirklin, 12 miles, was traversed in the same number of minutes. A similar distance between Sheridan and Carmel was run in 13 minutes, while Roselawn to Fairoaks, 7 miles, was covered in 6 minutes. As these times and distances are only given in even figures, the speed record cannot be regarded as exactly accurate for these short distances, where a few seconds or a few rods make a considerable difference in the speed. The best record appears to have been made between Roselawn and Monon, where the distance was sufficient to eliminate the effect of small inaccuracies in time or distance. The 33 miles between these stations was traversed in 34⅓ minutes, giving a speed of 57.4 miles per hour. This is a high rate of speed for any distance, especially on a single track road. The line crosses another road at Fairoaks, between Roselawn and Monon, where this run was made. There are no less than nine points where one or more roads are crossed between Hammond and Indianapolis. Making an allowance of only three minutes loss at each crossing, the time would be reduced to 3 hours 12½ minutes, which gives a speed of 50.8 miles per hour, including *other* stops between Hammond and Indianapolis.

Though the train consisted of only one car, this was fast work and reflects great credit on those concerned.

Another fast run with a Chicago *Inter-Ocean* newspaper special train was made on the 4th inst., from Chicago to Springfield, Ill., via the Chicago & Alton. The train left Chicago at 3.40 a. m., and made a fine run as far as Bloomington. Soon after leaving Bloomington the engine broke an eccentric strap, causing a delay of over one hour in arriving at Springfield. The highest speed appears to have been attained between Pontiac and Normal, 32 miles being covered in 36 minutes, a speed of 53.3 miles per hour. X.

An American Superintendent in England.

MANCHESTER, Oct. 25, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The exaggerations of travelers are proverbial, also the misleading nature of their records. The cause of unreliability in travelers' tales is not necessarily a result of a perverse and untruthful nature; it is often due to a deficiency in the traveler's powers of observation, sometimes to positive physical incapacity, such as short-sightedness, and is frequently caused by generalizing from insufficient basis. Now, were I to write to *The Engineer*, for example, and state that when in America I never saw a locomotive west of the Mississippi that weighed above 200,000 lbs. it would be perfectly true, but might lead to the impression that beyond the Mississippi there were none but small engines and 18 in. gauges. Those who knew better would perhaps set me down as untruthful, while only a few would know I had never been so far west, and that my statement, though true, had no value.

To-day, however, I see that in a recent number of the *Gazette* you publish just such a quality of statement as the observations of an American Superintendent. The impression conveyed by his remarks to a reader knowing nothing of English practice will certainly be that no passenger cars here have bogies or trucks, that all brake blocks are of wood and that fire-box doors open into the fire-box.

Fresh from reading this letter of Major Myers I took train home for lunch, and noticed first that I was traveling in a carriage which had 12 wheels; that is, it had two six-wheel trucks. It had also iron brake blocks. On returning to the city, I first noticed in the Manchester terminus a heap of wornout iron brake shoes. Next I saw that fully half of the carriages standing in the depot were bogie carriages, the trucks being variously four-wheeled and six-wheeled, and, finally, I searched them all and did not find a single wooden brake-block amongst the whole of them, and they belonged variously to two distinct companies. Now, surely, Major Myers could not have stood at any one of the principal termini in London without an opportunity to see what he declares he did not see.

Then as to the inwardly opening fire doors, usually a little open. Was not your correspondent misled by the deflector plate? As is well known, the application of a deflector plate in the door opening arranged to turn a downward current of air into the box to meet the hot gases from the fuel, will, in combination with the fire-brick arch, effect a better combustion and, properly managed, prevent smoke. When gas is being given off from burning coal, I mean more especially the hydro carbon gases, it is essential that some air be admitted above the fuel, or such gases will pass off unconsumed. Hence, running with an open door.

The American Superintendent says that cinders are rare and smoke almost entirely avoided. Here, and, in fact, throughout England, it is contrary to law to produce black smoke, and special smoke inspectors are employed, whose duty it is to note the behavior of all factory chimneys. Offenders are fined often as much as twenty-five dollars, with costs.

Now, to burn coal in a stationary boiler furnace without producing smoke there are four conditions which must be present. First, air must be admitted in proper quantity above the fuel to supply oxygen to the hydrocarbons. Secondly, such air must be well mixed with the gases. Thirdly, the mixture must be heated to about 1,000 deg. F. by the time it reaches the bridge where ignition must take place, and will do so if the foregoing conditions are present. The fourth condition is that beyond the bridge or point of ignition there should be a considerable space for the expansion of the burning gases, which increase greatly in volume by the heat of combustion. All these conditions may be secured in Lancashire, Cornish or underfired boilers, but the last condition may sometimes be negatived in a very simple manner, and I have known a case where placing a water pipe close up to the bridge has caused dense volumes of smoke from the interference it has been to the free expansion of the burning gas, whilst the fault has been cured by so small a thing as building a thinner bridge and leaving some clear space between the bridge and the water pipe.

Bearing these conditions in mind, it is evident that in a locomotive fire-box, without the brick arch, the products of combustion can pass readily into the nearest tubes wherein flame is at once extinguished and smoke must be formed. Thus to render smokeless a furnace of the locomotive type, it is necessary to bring it if possible into a shape approximating to the familiar stationary furnace, for it is clear that in a plain rectangular box there can be no proper admixture of air (admitted through the door) with the gases from the fuel, nor is there an igniting point, or point of concentration, as over the bridge wall in the stationary boiler. The addition of the brick arch effects both these objects in conjunction with the deflector plate more especially. By them the furnace is divided into two distinct portions, each having its own particular function. In the lower half carbon is burnt and hydrocarbons are distilled. At the centre, where the box is narrowed by the arch, is the point of concentration and ignition, and in the upper half of the box, in the space bounded by the four sides and crown, combustion is completed and the products pass to the tubes. By this means the crown of the box is better utilized as a means of raising steam and the heat arising from the combus- of the hydrogenous portions of coal is usefully obtained, whereas without the brick arch this is never done other than partially or not at all. And as the calorific power of the hydrogenous gases may amount to a fourth of the whole heating power of the fuel it is clearly essential to economy that means be taken to secure this end. A plain box with numerous small tubes directly out of it, as in a locomotive, is a poor thing as a furnace. By adding a suitable arch of brick the whole character of the box may be changed and its working altered.

I have been rather drawn off from the subject upon which I started, that of the mistakes of travelers, and concerning which I was led to write, because I am quite at a loss to understand how it is that the same mistatements are continually being repeated. W. H. BOOTH.

[The letter of Major E. T. D. Myers, to which Mr. Booth refers, appears to have been, in general, very correct, and while cars with a flexible wheel base are largely used on several roads in England, many visitors, like Major Myers, might fail to see an American truck or recognize the fact that the eight wheels used, for instance, on the Metropolitan (underground) cars radiate to a curve, and are not "rigidly attached to the frames." As to brake-shoes, we believe that English practice is invariably to make the cast-iron brake-block and shoe in one piece, and scrap it when worn out. The Westinghouse brake in England and France is so fitted, the shoe being directly attached to the metallic brake-beam and to the hanger. Wooden shoes were, however, universal in England 15 years ago, when the Westinghouse and Smith's vacuum brakes were first introduced. Cast and wrought iron shoes had been tried and abandoned in the early days of railroads, but it was soon found that *soft* cast iron shoes did not injure steel tires and were more durable and held better in wet weather than wood. Recently, however, a prominent English superintendent of motive power informed us that he found iron shoes were far the most expensive, and that he hoped to save $25,000 per annum by going back to wood shoes, which are made of Lombardy poplar, a timber that is practically useless for any other purpose, and is, therefore, very cheap.

As regards the fire door opening inwards, the writer has ridden on many English engines, in which a door opening inwards was generally used in ordinary firing. The door was hinged from the top, and when opened directed the current of air down on the fire instead of allowing it to rush straight for the flues. This door was, however, mounted in another larger door which opened outward in the usual manner, swinging on a vertical hingepin. This large door is used when cleaning or examining the fire when standing. A door opening inwards is sometimes operated by a lever with spring latch and quadrant (like a reversing lever) so that the door can be set at any angle, and so regulate and direct the current of air down on the fire.* —EDITOR RAILROAD GAZETTE.]

English Engines on Rough Roads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice that in Mr. Richards' paper on "Quick Journeys and Fast Running" (before the New England Railroad Club), he states that "the American engine is better than the English because it can run on English roads, whereas an English locomotive could not run on an American road." Will you allow me to ask Mr. Richards through your columns what proof he has of these assertions? The authorities of the Pennsylvania road evidently do not believe that English locomotives are inherently unfit for American roads, for they have ordered a Webb compound, and I understand wish it to be in every respect exactly like an English main line express engine.

English locomotives are now in very successful use in nearly every part of the globe, and I am at a loss to know why they should not do as well here as on the frozen roads of Canada, the burning plains of India and the sandy deserts of Africa. I have used them successfully up a grade of 274 ft. per mile and round curves of 100 ft. radius on the standard gauge, and on a grade of 130 ft. per mile 15 miles long and round curves of 330 ft. radius on the narrow gauge, so that I think this disposes of the oft-alleged want of flexibility. I have also used them where the line was ballasted with earth which turned to mud under heavy tropical rains, and where the track was so rough that the whole train rolled like a ship in a seaway, and I think that if Mr. Richards had ever seen English engines working on contractors' lines, which are far rougher than any American line, and are not laid with even a pretense at surfacing or ballasting, he would know that a plate frame and good springs give all the flexibility possessed by an American engine, with its more rigid bar frame, smaller springs and equalizers.

I am bound further to say that I have known American Mogul engines to leave the road repeatedly at bad frogs passed over in perfect safety by English engines with the same maximum weight on a wheel.

The whole matter has been much obscured by dogmatism, and if switching engines are safe with six coupled wheels and no truck, why should a truck be essential on a main line where the permanent way is in better condition and the frogs not so frequent? Yet this is precisely English practice, and indeed these trucks are very general under switching engines and are rarely used under main line freight engines, while here the practice is reversed. HELIOS.

Railroads of the Argentine Republic.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Of the states of South America the Argentine Republic is among the most prominent, holding the second place in respect to population, its own being between three and one-half and four millions, and as well by virtue of its importations, which amount to $900,000,000. It is accordingly of interest to note its progress and development in the matter of railroads, this bearing directing on the interests of the great manufacturers of railroad materials who are located in this

*This style of fire door is shown on a London, Brighton & South Coast locomotive, Figs. 139 and 141, *Recent Locomotives*,

country, and who feel the need of new markets abroad to take their surplus production.

The territory of the Argentine Republic covers 1,200,000 square miles. A great part of this territory, nearly half, is perfectly level, suitable for every form of agricultural enterprise, and pre-emirently adapted for the construction of railroads; the northern and western districts are mountainous, and render necessary the construction of important engineering works for the extension of lines, especially in the vicinity of the Andes.

The initial steps in railroad construction were taken in 1857, and the progress was for a time slow, owing to the struggles that preceded the definite and permanent organization of the government in its present form; but in 1868 began a steady advance, which has been uninterrupted, and which promises to augment in the future. At this date there is in operation 4,535 miles of track, representing a capital of $189,000,000, which has produced in the past year net earnings of $10,627,000. The traffic was 8,000,000 passengers carried, and 4,000,000 tons of freight.

These lines are controlled by eight or ten leading companies organized with English capital. Only one of them is the property of the state of Buenos Ayres, and is administered by its representatives. The private companies were generally based at the start; 1st, on guarantees by the general government on the capital invested (usually 7 per cent.), this amount to be reimbursed to the government when the profits of the road should exceed this return; 2d, on the concession of lands suitable for colonizing. The government fulfilled its obligations honorably, and at present the companies are rturning the sums received as guarantees.

There are at present a number of roads in construction, the most notable of which is being pushed through the passes of the Cordillera of the Andes to meet the Chilian lines, proceeding from the sea coasts of the Pacific. It is calculated that in three years this line will be in operation, when passengers from Europe will be enabled to avoid the Cape Horn passage, and thereby save eight days. Perhaps, too, the day is not far distant when the project shall be realized of a railroad skirting the whole length of the Brazilian coast, from Cape San Roque, in the Province of Pernambuco, and connecting with the Argentine system, in which case the passage from Europe to the River Plate will be shortenened ten days, and that from Europe to Chili twenty.

In the last few years there has appeared what may be termed a railroad fever in the Republic and the Argentine Congress has granted concessions with guarantees ranging between 5 and 6 per cent. for 90 new lines, representing an extension of 30,000 miles approximately, and a total capital of $1,000,000,000.

Undoubtedly a large number of these concessions will never be put in execution, since they do not represent actual needs of population or of commerce, but it is unquestionable that many of them are practicable, and will be built in the near future. One of the most important among them is that which, starting from the city of Buenos Ayres, on the Atlantic coast, the capital of the Republic, trends towards the southeast, crossing the Andes at their point of greatest depression, and connecting there with the Chilian lines in the Province of Concepcion. As well must be considered of great importance, and as possessing an assured future, those lines which, extending toward the north, aim to draw the commerce of Bolivia, with its inexhaustible mineral wealth.

The greater part of the lines being operated by English capital, the materials and methods of operation are naturally copied in the main from those employed in England. However, the superiority of American methods is beginning to be recognized, especially in the points of economy of construction and the character of the rolling stock. And in connection with a population relatively sparse, and extending over an immense range of territory (which only awaits the coming of labor to become a centre of population and wealth), these are points of transcendent importance.

At present there are on the Argentine railroads 700 engines, 2,000 passenger coaches, and from 15,000 to 20,000 freight cars, only a small fraction of which have been constructed in the United State; but at this time contracts have been entered into with various American manufacturers, embodying the most advanced models, and with the aim of testing their economic conditions on a larger scale.

If, as is probable, considering the experience of the United States, with its network of rails, the most extensive in the world, the results are as satisfactory as are hoped for, there is a likelihood that a reaction may assert itself among the Argentine railroads, with the result that American capital and manufacturers may there secure a vast and profitable market. To this result may especially contribute the measures that shall be taken by the congress of delegates from the American republics, initiated by the President of the United States.

MIGUEL TEDIN,
Commissioner of Provincial Railways.

State Railroad Commission Reports.

VERMONT.

The first biennial report of the railroad commissioners of Vermont has been submitted to the Legislature. The board commends the increasing tendency toward consolidation of the smaller and shorter roads into a few larger systems, each under a single head and control. It is claimed that under this policy expenses of management and operation have been reduced; more efficient train service and larger accommodations to the public have been furnished; a better class of equipment has been provided; an improvement in the condition of the roads, track and bridges has been made, and better and more convenient facilities, by way of connec-

NEW CONSTRUCTION, JANUARY 1 TO OCTOBER 1, 1888.

NAME OF ROAD.	Track laid between Jan. 1 and Oct. 1.			Under construction.		
	From	To	Miles	From	To	Miles
Aberdeen, Bismarck & N. W.				Aberdeen, Dak.	Bismarck	162
Albemarle & Pantego	Mackey's Ferry, N.C	Juniper Landing	10	Juniper Landing	Southward	2
Allegheny & Kinzua	Bradford, Pa.	Weedsport, Pa.	11			7
"	Redhouse, N. Y.	Up Redhouse Run	4			
Americus, Pres. & Lumpkin				Louvale	Chattahoochie R.	12
Anniston & Cincinnati	Attala, Ala.	Dukes, Ala.	18			
Arizona & Southeastern				Fairbanks, A. T.	Bisbee	36
Atchison, Topeka & Santa Fe—						
So. Kan. of Tex.	Former terminus	Panhandle City	4½			
So. Kan. & Panhandle	" "	Engelwood, Kan.	5			
So. Kansas	(Frontenac Ext'n).	Pittsburgh, Kan.	2½			
Chic., Kansas & Western	Concordia, Kan.	Superior, Neb.	37½			
Atlanta & Florida	Fayetteville, Ga.	Yatesville, Ga.	46	Atlanta, Ga.	Fort Valley, Ga.	33
Atlantic & Danville	W. Norfolk, Va.	Franklin, Va.	40	Franklin	Lawrenceville	50
Augusta & Chattanooga	Augusta, Ga.	Kiokee Creek, Ga.	20			
Austin & Northwestern				Burnet, Tex.	Marble Falls	17
Baltimore & Ohio	Big Walnut	Williams	4½	Big Walnut	Kirkesville	8½
"	Carrol Switch	Clifford, Md	2			
Berkeley Springs & Pot	Hancock, Va.	Berkeley Sp., Va.	6			
Bangor & Portland				Pen Argyle, Pa.	Wind Gap, Pa.	2½
Barre				Barre, Vt.	Quarries	3
Bay of Chaleurs	Matapedia	Carleton, Que.	40	Carleton	Paspebiac	60
Beauharnois Junc	Melocheville, Ont.	Valleyfield, Ont.	10			
Beaver Creek & Cumb. Coal Co.				Near Greenw'd, Ky.		2
Billings Clark's F. & Cook C.				Billings, Mont.	Coal mines	51
Birmingham Mineral	Boyles, Ala.	Trussville, Ala.	48	Village Springs	Chepultepec	18
"	" "	Northward				
Bishopville	Scarboro' Mill, S. C.	Shaws, S. C.	6	Shaws, S. C.	Yoseys, S. C.	1
Blackv., Ulster & Newburg	Salleys, S. C.	Wagener	8	Wagener	Selvern	5
Boston, Winth. & Shore	Winthrop, Mass.	Revere	3			1
Brantford, Waterloo & L. E.				Waterford, Ont.	Brantford	8
Brockv., Westport & S. S. M.	Lynn, Ont.	Westport	18	Lynn	Brockville	5
Brookfield				N. Brookfield, N. Y.	Brookfield	7
Brooklyn, Bath & West End	Brooklyn, N. Y.	Bath Junc., N. Y.	1			
" " "	Unionville	Coney Island	2			
Burl. & Mo. River	Blakeman, Kan.	St. Francis, Kan.	39			
" "	Lakeside, Neb.	Alliance, Neb.	23			
California Central	Inglewood	Redondo Beach, Cal	11			
" "	Perris	San Jacinto, Cal.	19½			
" "	Ballona Junc	Orange, Cal.	29½			
" "	San Juan	Los Ang'es Jun., Cal	24			
Cape Breton				Canso, C. B.	North Sydney, C. B.	100
Canadian Pacific	Farnham, Que.	Lennoxville	61			
"	Holeb, Me.	Mattawamkeag	129			
Cape Girardeau S. W.	Chaonia, Mo.	Tunnel Hill	10	Tunnel Hill	Williamsville, Mo.	2½
" "	Wappelo, Mo.	Chaonia, Mo.	6	Williamsville	C. Riv. R. R.	21
Cape Fear & Yad. Val	Pilot Mountain	Mt. Airy, N. C.	14½			
Madison Branch				Stokesdale, N. C.	Madison	11
Wilmington Extension				Fayettsville	Wilmington	81
Carolina, Cumb. Gap & Chic.	Aiken, S. C.	Edgefield	25			
Carthage & Adirondack				Jayville, N. Y.	Little River, N. Y.	14
Central of Georgia	Clayton, Ala.	Ozark	35	Buena Vista, Ga.	Columbus	35
Savannah & Western				Eden, Ga.	Eastward	7
Columbus & Western	Sylacauga, Ala.	Childersberg	10			
" "	Childersberg	Cahaba River	27			
Central Vermont	Barre, Vt.	Williamstown	7			
Charleston, Cin. & Chi.	Camden	Towards Blacks, S.C	76			17
" "				Augusta, Ga.	Newbury	70
Chatt., Rome & Columbus	Chattanooga, Tenn.	La Fayette, Ga.	25	La Fayette, Ga.	Carrollton, Ga.	75
Chattanooga Union	Forest Hill	Mountain Junction	1½	Stanleytown	Sherman Heights	1½
"	Orchard Knob	Stanleytown	1			
Chattanooga & Look. Mt.	Chattanooga, Tenn.	Lookout Mt.	10			
Chesap., Ohio & S. West.	Moffatt, Tenn.	Troy, Tenn.	4			
Chic., Burl. & Kan. City				Fannington, Ia.	Coal mine	2
Ill. Valley & No.	Walnut, Ill.	Streator	60			
Chic. & Eastern Illinois	Momence, Ill.	Goodland Junc., Ind	36			
Chicago, Kan. & Neb.	E. line M'de Co., Kan	S. W. to state line	64			
" " "	State line	S. W. (Ind. Ter.)	21			
" " "	Smith C't'r, Kan	Col. line	160			
" " "	W. line, Kan.	Col. Springs, Col.	142			
Chic., Milw. & St. P.	Alva, Wis.	Zeda, Wis.	5½			
Chic. & Northwestern	Lake Geneva, Wis.	Williams' Bay	6			
"	Ishpeming, Mich.	Michigamme	33			
Chic., St. L. & Paducah	Parker City, Ill.	Metropolis, Ill.	31½	Metropolis	Brooklyn	7
Chic., St. P. & Kan. City	In St. Joseph, Mo.		5			
Chino Valley	Ontario, Cal.	Southward	10			
Cin., Ham. & Dayton				Main line	Lockland, O	1
Col., Findlay & Nor.	McComb, O.	Findlay, O.	9			
Cin., Jackson & Mack.	Carlisle, O.	Franklin, O.	3			
Clarendon & Pittsford	Center Rutland, Vt.	Proctor	5			
Clearfield & Jefferson	Horatio, Pa.	Northward	1			
Cleve., Akron & Columbus	Warsaw	Dresden Junc.	11	Coal branch		3
Cleve., St. L. & Kan. City				Alton, Ill.	St. Charles, Mo.	20
Colorado Midland	Marcon, Col.	Aspen, Col.	2	Glenwood Springs	New Castle, Col.	12
"	Aspen, Col.	Smuggler Mt., Col.	1			
Columbia & Greenville	West Union, S. C.	Walhalla	2			
Columbia, Newbury & L.				Columbia, S. C.	Spartanburg	42
Columbus (Ga.)	Local road		10			
Columbus Southern				Columbus, Ga.	Albany, Ga.	87
Coronado	Coronado, Cal.	San Diego, Cal.	17			
Cooperstown & Susquehanna V.				Cooperstown Junc.	Davenport Centre	8½
Covington Transfer	Covington, Ky.	Ludlow, Ky.	2			
Covington & Macon	Monticello, Ga.	Athens, Ga.	45			
Cumberland Ry. & Coal Co.	Spring Hill, N. S.	Towards Salt Spr's.	4	Spring Hill	Oxford	14
Cumberland Valley				Martinsburg	Winchester, W. Va.	22½
Current River	Birch Tree	Grandin, Mo.	81			
Denison Barham New Orl.				Denison, Tex.	Barham, Tex.	20
Denver, Texas & Ft. Worth	Trinidad, Col.	Texas state line	125	Trinidad, Col.	Coal mines	20
Detroit, Bay City & Alpena	Branches		9			
Detroit, Lansing & No.	Mullikan, Mich.	Thornapple R.	31			
Grand Rapids, Lans. & Det.	Oakdale Park	Reed's Lake	2½			
Dodge City, Mont. & Trinidad	Dodge City, Kan.	Montezuma	27½			
Duluth & Iron Range	Tower, Minn.	Ely, Minn.	21			
Duluth, Red Wing & South.				Red Wing, Minn.	Albert Lea, Minn.	90
Duluth, S. S. & Atlantic	Nestoria	Iron Riv. Junc.	106	Main line	Ironwood	10
" " "				Nemadji R.	West Superior	8
Durham & Northern	Henderson, N. C.	Durham	12			30
Eastern Minnesota	Hinckley, Minn.	West Superior	70	N. P. Bridge	Union D'p't, Duluth	3
" "				Sandstone	Quarries	2
Eau Claire, Wis. & L. Superior				Eau Claire, Wis.	Independence, Wis.	36
Eutawville	Vance's, S. C.	Santee River	2½	Santee River	Brocton	15
Elgin, Pit. & Havelock				Havelock, N. B.	Kuth's Mills	1½
Elgin, Joliet & Eastern	Eola, Ill.	Spalding	16	Joliet	Hobart	50
" "	Joliet	London Heights	2	Plainfield	Gordon	32
Elizabethtown & Hodge	Elizabethtown, Ky.	Hodgensville, Ky.	11			
Farmville & Powhattan				Jennings' Cross., Va.	Farmville, Va.	64
Florence	Dillon, S. C.	Rowlands, N. C.	10			
Florida Midland	Wayco, Fla.	Harper's, Fla.	2	Harper's, Fla	Kissimmee	14
" "	Longwood	Eastward	2			
Forest City & South East.				Forest City, D. T.	Gettysburg, D. T.	10
Ft. Worth & Denver City	Dallam, Tex.	State line	23			
" " "	Washburn, Tex.	Panhandle City	14½			
Fremont, Elkhorn & M. V.	Geneva, Neb.	Superior, Neb.	45			
" " "	Creighton, Neb.	Verdegris, Neb.	12			
Wyoming Central	Glen Rock, Wy.	Casper, Wy.	24			
Gadsden Belt	West Gadsden, Ala.	Coosa River,	2⅚	West Gadsden	Black Creek Falls	2
"				West Gadsden	Atlanta	4½
Fresno, B. & Yosemite	Fresno, Cal.	Belmont Colony	½	Belmont Colony	Eisen Vineyard	7
Georgia Pacific	Woodlawn, Ala.	Bessemer, Ala.	18½	Columbus, Miss.	Johnsonville, Miss.	142
Georgia S. & Florida	Avondale, Ga.	Eldorado, Ga.	105	Eldorado	Valdosta, Ga.	37
Georgia, Carolina & N.	Monroe, N. C.	Chester, S. C.	33			12
Grafton & Upton				Grafton Ctr., Mass.	W. Upton, Mass.	5
Grand Trunk Junction	Elsdon, Ill.	C. & W. I. Junction	4			
GreenPond, Walterboro & Greenv	Walterboro, S. C.	Bells Cross Roads	2			
Gulf, Colorado & Santa Fe	Ballinger, Tex.	San Angelo, Tex.	36			
Hancock & Calumet	Near Hancock, Mich	Southward	4			
Housatonic	Botsford, Conn.	Derby, Conn.	13½			
Huntsville Belt & M. S.	Huntsville, Ala.	Monte Sano	5			3
Ilwaco & Shoalwater B.	Ilwaco, Wash. T.	Long Beach, W. T.	4	Long Beach	Shoalwater Bay	12
Illinois Central	Near Rockford, Ill.	Eastward	67			
Chicago, Mad. & Nor.	Dodgeville, Wis.	Southward	28			
" "	Madison, Wis.	"	2			
Intercolonial	Oxford, N. S.	Pictou, N. S.	26			44
Jacksonville & Mayport	Jacksonville, Fla.	Mayport	20			
Kansas City & Pacific	Erie, Kan.	Vance, Kan.	46			
Kansas City Belt			2			3
K. C., El Paso & Mexican	El Paso, Tex.	Northward	10	Thence	White Oaks, N. M.	150

NEW CONSTRUCTION, JANUARY 1 TO OCTOBER 1, 1889—Continued.

Name of Road.	Track laid between Jan. 1 and Oct. 1.			Under construction.		
	From	To	Miles	From	To	Miles
Kansas City & Rich Hill				East Lynn, Mo.	South	22
" " "				East Lynn	Pleasant Hill, Mo.	8
Kanawha & Ohio	Koll Transfer, Va.	Campbell's C'k, Va.	2½	Campbell's Ck	Walden, Va.	2
Kansas & Ark. Valley	Van Buren, Ark.	Wagoner, I. T.	84			
Kans. City, Ind. & P.	Kansas City		1			
Kans. City, Mem. & Birm.						
Bessemer Branch	Easley, Ala.	Bessemer	11			
Coal Creek Branch	Parksville	Coal Mines	2			
Kansas City Southern	Kansas City, Mo.	Harrisonville, Mo.	42	Harrisonville	East Lynn, Mo.	6
Kans. City, Texarkana & Gulf				Red River	Antimony Riv., Ark	50
Kan. City, Wyandotte & N. W				Senaca, Kan	Northwest	14
Kentucky Midland				Frankfort, Ky.	Paris, Ky.	40
Kentucky Union				Lexington, Ky.	Union Junc., Ky.	27
"				Clay City, Ky.	Jackson, Ky.	58
Lake Erie & Western	Mackinaw Riv., Ill.	Faunsdale, Ill.	15			
Lackawanna & Pittsburgh	Hornellsville, N. Y.	Hornellsv. Junc.	10			
Lehigh & Lackawanna	Wind Gap, Pa.	Saylorsville, Pa.	5			
Lehigh Valley				Fairview	Pittston, Pa.	17
"				Mahanoy City	(Local road)	2½
Lehigh Valley—						
Roselle & So. Plainfield				Roselle, N. J.	So. Plainfield	10
Lime Rock	Knox & L. R.R.	Rockland, Me.	4			
Long Island				Locust Valley	Oyster Bay	4
"						
Los Angeles County	Los Angeles, Cal.	Burbank	10	Los Angeles	Santa Monica	13
" "	" "	Prospect Pk	2½			
Los Angeles & Ocean				Los Angeles, Cal.	San Pedro, Cal.	24
Louisville Southern	Louisville, Ky.	Burgin, Ky.	82	Harodsburg, Ky.	Danville	9
" "				Versailles, Ky.	Georgetown	10
" "				Lawrenceburg, Ky.	Lexington	25
Louisville, St. Louis & Texas	Owensboro, Ky.	Cloverport, Ky.	38	Owensboro, Ky.	Henderson, Ky.	29
" " "	West Point, Ky.	Owensboro, Ky.	90			
Louisville & Nashville	Barboursville, Ky.	Pineville, Ky.	17	Pineville, Ky.	Cum. Gap Tunnel	14
Louisiana No. & So.	Homer, La.	southward	6			
Lynchburg & Durham	Lynchburg, Va.	Rustburg	10	Rustburg, Va.	South Boston	50
"				Durham, N. C.	Northward	10
Macon & Dublin				Macon, Ga.	Dublin, Ga.	55
Manitoba Central	U. S. Line	Winnipeg	71	Winnipeg	Portage la Prairie	60
"						
Manitoba & Northwestern	Langenburg, N.W.T.	Saltcoats, N. W. T.	26			
Manistee & Northeastern	Manistee, Mich.	Onekana, Mich.	13	Manistee	Tp. 23 Range 14 W.	30
Marietta, Col. & Nor.	Big Run, O.	Stewart, O.	5			
Mexican National	Carneros, Mex.	San Miguel, Mex.	326			
Michigan Central	in Detroit		4	Lumber branches		16
" "	Oil Springs, Ont.	Edy's Mill, Ont.	2½			
" "	Niagara, Ont.	Chatauqua, Ont.	1			
Midland of Indiana				Ladoga, Ind.	Brown's Valley	10
Milwaukee, L. S. & W.	Rhinelander, Wis.	Flambeau	27½	Hurley	Southward	5
Minnesota & Dakota				Fargo, Dak.	Otafe, Dak.	100
Minn., St. P. & Sault Ste. M.	Cardigan Jnc., Minn.	Soo Line Junc.	5½			
Missouri Pacific	Talmage, Neb.	Crete, Neb.	58	Ft. Smith, Ark.	Greenwood, Ark.	18
"	Booneville, Mo.	Lexington, Mo.	77			
Mobile & Birmingham	Spratly, Ala.	Atkieson, Ala.	24			
Montana Central	Great Falls	Sand Coulee	16			
" "	Silver	Mariesville	6			
" "	Helena	Fair Ground	1			
" "	"	Butte	65			
Monroe & New Orleans				Rob Roy	toward Raineyville.	10
Moose River	Moose River, N. Y.	McBett's Camp	7			
Napanee, Tamworth & Quebec				Tamworth, Ont.	beyond Marlbank	10
Narragansett Pier				Narragans't Pr. R.I.	South Ferry	4½
Nashville & Tellico	Athens, Tenn.	Tellico Plains	22			
Nashville & Knoxville	Lebanon, Tenn.	Gordonsville, Tenn.	32	Gordonsville, Tenn.	Cookeville, Tenn.	37
Nashv., Florence & Shef.	Iron City, Tenn.	Florence, Ala.	19½			
Natchitoches	Prudhomme Sta.	Natchitoches, La.	11			
New Castle & Shenan. Val.	New Castle, Pa.	West Middlesex	16			
New York & Northern	Van Courtlandt	Yonkers, N. Y.	3			
Nevada & California	Doyle, Nev.	Northw. & Southw.	14			
Norfolk & Va. Beach				Virginia Beach, Va.	Ocean Park, Va.	1
Northern Pacific	Nr. Corvallis, Mont.	Grantsdale	10½	Fred Burr Co.	Granite Mine	4
" "	Colton, W. T.	Genesee, Idaho	14	Cheney, W. T.	Davenport	30
" "	Green River Sta.	P. Kirk Coal Mine	3			
" "	Phelpsburg, Mont.	Fred Burr Co.	3			
Omaha, Dodge City & So.	Dodge City	Montezuma, Kan.	30	Superior, Neb.	Dodge City, Kan.	200
" " "				Dodge City, Kan.	Trinidad, Col.	246
Orange Belt	Tarpon Springs, Fla.	St. Petersburg	32			
Oregon Ry. & Nav. Co.	Wallula, W. T.	Centerville, Or.	34	63 M.P. on C.&P.RR.	Dutch Flat Junc.	48
" "	" "	Eureka Flat, W. T.	18	Farmington	Rockford	33
" "	Willow Creek, Or.	Heppner, Or.	33			
" "	Ripana, W. T.	53 M.P. on C.&P.RR.	25			
Oregon & Wash. Territory	Waterman's	Centreville, Or.	5			
" "	Hunt's Junction	Fulton	14	Eureka Flat Junc.	Estes	20
" "	Wallula	Walla Walla	30			23
Orlando & Winter Pk.	Orlando, Fla.	Towards Winter Pk.	2			6
Palmdale	Seven Palms	Palmdale, Cal.	6½			
Paragould & Buffalo Isl.	Paragould, Ark.	Towards St Fr'ncis R.	5½			
Pensacola & Memphis				Pensacola, Fla.	Northwestward	65
Penn., Poughkeepsie & Boston				Poughkeepsie Br.	Campbell Hall, N.Y.	27
Peoria Terminal				Peoria		3
Phila., Wilm. & Balt.	Shellpot Br. (Wilm.)		5			
" "	Wilmington	Newcastle, Del.	6			
Pittsb., Shen. & Lake Erie	Greenville, Pa.	Amasa, Pa.	3½	Amasa, Pa.	Conneaut, Pa.	50
Pomona & Elsinore				Pomona, Cal.	Temercal Cañon	20
" "				Elsinore		5
Pontiac Pacific Junc.				Black River	Pembroke, Ont.	14
Portland & Vancouver	East Portland, Or.	Columbia R.	7			
Portland & Willamette V.	In Portland		½			
" "	Tulquart's Landing	Willamette R.	1½			
" "	Iron Works	Oswego	2½			
Powell's Valley				Knoxville, Tenn.	Cumb'd Gap, Tenn.	63
Raleigh & Augusta—						
Carthage	Cameron, N. C.	Carthage, N. C.	10			
Raritan River	South Amboy, N. J.	New Brunswick, N.J.	4			8
Richmond & Danville	Jarretts, N. C.	R. M. Gap	3	Red M. Gap	Murphy, N. C.	27
"				Winston, N. C.	Wilkesboro	74
Oxford & Clarksville	Clarkesville, Va.	Oxford, N. C.	25	Oxford, N. C.	Durham, N. C.	33
Ripley & Mill Creek Val.				Millwood	Jackson, C. H.	13
Roanoke & Tar River	Beverly, N. C.	Lewiston, N. C.	4			
Roanoke & Southern				Sal'm & Wins'n, N.C.	Walnut Cove	18
" "				Martinsville, Va.	N. C. Line	14
Rochester & Glenhaven	Rochester, N. Y.	Glen Haven	3½	Glen Haven, N. Y.	Irondequoit Bay	1½
Rockaway Valley	White House, N. J.	Germantown, N. J.	4			
Rome & Decatur	Farill, Ala.	Turkeytown, Ala.	32			
St. Aug. & South Beach				Ocean Beach	South Beach	3
St. Catherines & Niagara Cent.	Thorold, Ont.	St. Catherines	5			
St. L., Sturgis & Battle Creek				Battle Creek, Mich.	Sturgis, Mich.	41
Canada St. Louis				Goshen, Ind.	Sturgis, Mich.	27
St. Louis, Alton & T. H.				Parker City, Ill.	Paducah, Ky.	40
Central (New Brunswick)	Hampton	St. Martins	30			
St. Paul, Minn. & Manitoba	Churches Ferry	St. Johns	55			
" " "	Watertown	Huron	70			
" " "	Wilmar	Sioux Falls	106			44
" " "	Great Falls, Mon.	Smelter	5			
St. L. & San Francisco	Bluff	Anthony, Kan.	10½			
St. Cloud & Sugar Belt				Kissimee, Fla.	Runnymeade	12
St. John & Halifax	E. Palatka, Fla.	Ralston	3½			
St. Louis, Alton & Springf.	in Alton, Ill.		1	Alton, Ill.	Newburn, Ill.	13
St. Louis & Cairo Short Line				Parker City	Brooklyn, Ill.	40
St. Louis & Chicago				Springfield, Ill.	Eureka, Ill.	75
St. Paul & Duluth	Thompson, Minn.	West Duluth	13½			
" "	West Duluth	West Superior	4			
San Antonio & A. Pass.	On Waco branch		56			
" "	Skidmore, Tex.	Kleburg	43			
" "	Gregory, Tex.	Rockport	20			
San Fran., Clear Lake & Humb.				Napa, Cal.	Clear Lake	67
San Fran. & North. Pac.—						
Marin & Napa	Ignacio, Cal.	Sears Point	7½			
Cloverdale & Ukiah				Cloverdale	Ukiah	28½
San Gabriel Val. R. T.	Monrovia, Cal.	Westward	10	Los Angeles, Cal.	Eastward	6
Salt Lake & Ft. Douglas	Salt Lake City, U.	Ft. Douglas	4			
Santa Ana, Fairview & Pacific	Santa Ana, Cal.	Fairview, Cal.	16			
Sault Ste. Marie & Western				Rhinelander, Wis.	Miss. River	175
Seattle, Lake Shore & Eastern	Snohomish Junc.	Northward	15½			7
" " " "	Spokane Falls	Westward	10			30
" " " "	Seattle, W. T.	Raging River	49	Raging River	Eastward	11
Selma & Cahaba Valley				Selma, Ala.	Bessemer, Ala.	97
Ship I., Ripley & Ky.	Cherry Creek, Miss.	Pontotoc, Miss.	8			
Sheffield & Birmingham	Delmer, Ala.	Jasper, Ala.	36			

tions at terminal points, have been provided. This is an unusual line for a state commission to take, but it is one in which an unprejudiced student of railroads will find a good deal of sense.

The board recommends legislation which shall gradually abolish grade crossings, also the propriety of providing by general enactment for gates or electric signals or the placing of flagmen at crossings where public safety may require them. The board suggests an amendment legalizing existing signs at crossings and providing that all crossing signs hereafter erected in this state shall be of some uniform pattern; and in case a change be made, it recommends that the standard crossing signs in use in New Hampshire and Massachusetts be adopted.

A law is recommended making it a misdemeanor, punishable by fine, for any one to go upon a railroad track or bridge without right—a recommendation which will be indorsed by every railroad company; and the very fact that it is made shows the progress of education in this matter.

A heating law is recommended almost, if not precisely, like that now in force in New York. The date suggested for it to go into effect is Nov. 1, 1889.

ALABAMA.

Major Henry R. Shorter, President of the Alabama Railroad Commission, has just made his report for the year ending June 30, last. There were built in the state during the year 530 miles of new road. Of this the Kansas City, Memphis & Birmingham built 118. Light local roads were constructed to the extent of 70 miles, half of which was in Birmingham and vicinity. There were 2,296 miles of road in the state at the end of the year. Tables are given of the expenses and earnings and of the tonnage of the railroads reporting, the Louisville & Nashville reporting by far the largest freight business. The report mentions a dozen cases where the commissioners decided upon the necessity of erecting station buildings, or of improving existing stations. One road has been ordered to provide two waiting rooms for passengers at each station. The Western of Alabama is the only road in the state entitled to credit for ornamenting station grounds.

The report reviews the present statute requiring railroad managements to comply with the orders of the Commission, and after stating that it is too broad recommends amending it so that any railroad management not complying with the orders of the Commission may be indictable and the offense be considered a misdemeanor, the offender to be fined not less than $50.

New Mileage to Oct. 1.

The new mileage shown in the accompanying two-page table is divided by states as below:

Alabama	283½	New Jersey	13
Arkansas	13½	New York	29½
California	317	North Carolina	111½
Colorado	275½	Ohio	47½
Connecticut	13½	Oregon	127½
Dakota	135	Pennsylvania	40½
Delaware	11	South Carolina	172½
Florida	91½	Tennessee	191
Georgia	253	Texas	231½
Idaho	8	Utah	4
Illinois	208½	Vermont	14
Indiana	24	Virginia	63½
Indian Territory	97	Washington Territory	127½
Kansas	562½	W. Virginia	14
Kentucky	223	Wisconsin	125
Louisiana	17	Wyoming	24
Maine	142		
Massachusetts	3	Total U. S.	5,043
Michigan	302½	Manitoba	97
Maryland	6½	Ontario	36½
Minnesota	210	Quebec	101
Missouri	224	New Brunswick	30
Mississippi	8	Nova Scotia	30
Montana	109½	Mexico	326
Nebraska	145½		
Nevada	14	Total foreign	620½
New Hampshire	8	Grand total	5,663½

Clearance in Width Required by Cars.

The width required for cars on railroads of standard gauge (4 ft. 8½ in.) is getting to be an important question of detail, from the fact that many of the roads built in earlier days were laid out with parallel tracks 11 ft. between centres, and outside clearance room was proportionate. For the requirements then, this distance was more than ample. In the meantime, in populous districts, permanent structures have been erected contiguous to the railroad property, which make expansion of width at a reasonable outlay almost impossible. On the other hand, more recently constructed railroads have been laid out on a basis of 13 ft. between centres of parallel tracks, and cars are being designed and used in accordance with the increased dimensions. The increase in size of cars is found in the width, height and length. It seems inevitable that in the closely built localities the alignments are curved and most troublesome.

The exact room required for safe passage of trains at various speeds cannot be calculated nor operated to a mathematical nicety, but the question arises, Can the various conditions be reduced to a finite quantity sufficient for practical purposes? With this in view the following is suggested for consideration:

1. The mathematical part of the subject may be considered as the ordinate at the centres of cars on the inside of curves and the external projection of the ends of cars on the outside of curves, as shown in fig. 1.

2. Cars on curves take a position deviating from the vertical in proportion to the amount of elevation given to the outer rail.

3. The side bearing plates and truck frames are supported on springs; if the springs on one side are compressed more than the springs on the other side, the body of the car will deviate from a vertical position.

4. Cars are usually set up with hangers in the trucks, which permit a swinging motion sidewise.

5. The distance between bearing faces of wheel flanges is less than the distance between rails, and admits of side motion or lateral play.

6. There may be extraneous conditions for isolated cases from physical defects or otherwise; or for instance some double-track railroads have the outer rails of curves on grades elevated differently, the curve on the descending side being elevated for a higher speed than the curve on the ascending side.

Fig. 1.

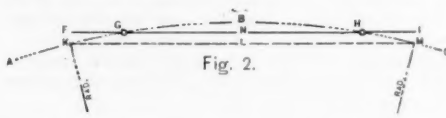


Fig. 2.

The first item, ordinates and externals, is not susceptible of exact adaptation for all lengths of cars on all degrees of curvature, but cars are usually built so that the ordinate and external are practically equal, which reduces the encroachment to a minimum.

Figure 2, let $A\ B\ C$ represent centre line of track, $K\ M$ chord of curve, the length of chord equals length of car equals l, $B\ L$ the versed sine of arc for length of chord l and radius R.

Then to place the centre line of car $F\ I$ on curve in such a position that king bolts G and H will be over the centre line of curve, and the ordinate $B\ N$ and external $F\ K$ shall be equal to each other, and their sum shall equal the versed sine.

$$F\,K = B\,N = \tfrac{1}{2}\left(R - \sqrt{R^2 - (\tfrac{l}{2})^2}\right) = a.$$

also distance between centres of king bolts,

$$G\,H = 2\sqrt{R^2 - (R-a)^2} = d.$$

Assume 30 ft. car on curve, radius 100 ft., also on curve, radius 1,000 ft., and 80 ft. car on curve, radius 100 ft., also on curve, radius 10,000 ft., the foregoing formulæ will give

30 ft. car R = 100 ft.; a = 0.5657 ft., and d = 21.26 ft.
30 ft. " R = 1,000 ft.; a = 0.0555 ft., " d = 21 ft.
80 ft. " R = 100 ft.; a = 4.176 ft., " d = 57.22 ft.
80 ft. " R = 10,000 ft.; a = 0.040 ft., " d = 56.57 ft.
21.26 ÷ 30 = 70.9, or d = 70.9 per cent. of l.
21.00 ÷ 30 = 70.0, " d = 70 " "
57.22 ÷ 80 = 71.5, " d = 71.5 " "
56.57 ÷ 80 = 70.7, " d = 70.7 " "

Assuming that distances between king bolts is from 70 per cent. to 71 per cent. of length of cars, the ordinates and externals may be calculated for all lengths of cars on all radii of curvature. See 3d column in table.

The second item is calculable if there be known the gauge of track g, the elevation of outer rail r and the height of the car h; by similar triangles the leaning of top of car $= \frac{r\,h}{g}$; usually the height of corner of roof may be called 12 feet, gauge, 4.71 ft.; hence leaning of top = 2½ times elevation of outer rail. The third item is usually the result of physical defects, but the leaning at top will be expressed the same as in second item $\left(\frac{r\,h}{g}\right)$ except that h must be measured from the bearing plate to roof of car; r in extreme cases may be taken = 1½ in., h = 10 feet, g as before 4.7; 10 × 1.5 ÷ 4.7 = 3¼ in.

INCREASED CLEARANCE FOR CARS ON CURVES.

Curvature.	Length of cars.	Ordinates and externals.	Leaning at top on curves.	Increase required. Outside of curves.	Between tracks.	Inside of curves.
	Ft.	In.	In.	In.	In.	In.
1 deg. Radius,5730'	30	1/8	2½	5¾	11½	8¼
	40	¼	" "	5⅞	11¾	8⅜
	50	⅜	" "	6	12	8½
	60	½	" "	6⅛	12¼	8⅝
	70	⅝	" "	6¼	12½	8¾
	80	⅞	" "	6½	13	9
2 deg. Radius,2865'	30	¼	5	5⅞	11¾	10⅞
	40	½	" "	6⅛	12¼	11⅛
	50	¾	" "	6⅜	12¾	11⅝
	60	1	" "	6⅝	13¼	11⅞
	70	1⅛	" "	7	14	12
	80	1¼	" "	7⅜	14¾	12⅝
3 deg. Radius,1910'	30	⅜	7½	6	12	13⅛
	40	⅝	" "	6¼	12½	13¾
	50	1	" "	6⅝	13¼	14⅛
	60	1½	" "	7⅛	14¼	14⅝
	70	2	" "	7⅝	15¼	15⅛
	80	2½	" "	8⅛	16¼	15⅝
4 deg. Radius,1146'	30	½	10	6⅛	12¼	16⅛
	40	⅞	" "	6½	13	16½
	50	1⅜	" "	7	14	17
	60	1⅞	" "	7½	15	17½
	70	2⅜	" "	8¼	16½	18¼
	80	3⅛	" "	9	18	19
5 deg. Radius,1146'	30	⅝	12½	6¼	12½	18¾
	40	1	" "	6⅝	13¼	19⅛
	50	1⅝	" "	7¼	14½	19¾
	60	2⅜	" "	8	16	20⅛
	70	3¼	" "	8⅞	17¾	21⅜
	80	4¼	" "	9⅝	19¼	22⅞
6 deg. Radius,955'	30	¾	15	6⅛	12¾	21⅜
	40	1¼	" "	6⅞	13¾	21⅞
	50	2	" "	7⅜	15¼	22⅝
	60	2⅞	" "	8½	17	23½
	70	3⅝	" "	9½	19	24½
	80	5	" "	10⅝	21¼	25⅞
7 deg. Radius, 819'	30	⅞	15⅝	6¼	13¼	22⅛
	40	1⅛	" "	7¼	14½	23½
	50	1⅜	" "	8¼	16½	24½
	60	2	" "	9⅜	18¾	25⅞
	70	2⅝	" "	10⅜	21½	27
	80	3⅜	" "	12⅜	24¾	28⅝
8 deg. Radius, 717'	30	1	16¼	6⅝	13¼	22⅝
	40	1⅜	" "	7⅛	14½	23½
	50	2⅛	" "	8¼	16½	24½
	60	3	" "	9⅜	18¾	25⅞
	70	3⅞	" "	10⅜	20¾	26⅞
	80	4¾	" "	11½	23	27⅞
9 deg. Radius, 637'	30	1⅛	16¾	6⅜	13¼	23⅝
	40	1⅝	" "	7½	15	24⅜
	50	2⅜	" "	8⅝	17¼	25½
	60	3⅛	" "	9⅞	19¾	26¾
	70	4	" "	11⅜	22¾	28¼
	80	5⅛	" "	13¼	26½	30¼
10 deg. Radius, 574'	30	1¼	17½	6⅞	13¾	24⅜
	40	2⅛	" "	7¾	15½	25¼
	50	3⅛	" "	8⅞	17¾	26⅜
	60	4⅛	" "	10⅛	20¼	27⅞
	70	5⅛	" "	12	24	29½
	80	6⅜	" "	14	28	31½
12 deg. Radius, 478'	30	1½	18¾	7⅛	14¼	25⅞
	40	2½	" "	8⅛	16¼	26⅞
	50	3⅝	" "	9⅝	19¼	28⅜
	60	5¾	" "	11⅜	22¾	30½
	70	7¾	" "	13⅜	26¾	32½
	80	10⅛	" "	15½	31½	34½
15 deg. Radius, 383'	30	1¾	20	7⅜	14¾	27⅜
	40	3⅛	" "	8¾	17½	28¾
	50	4⅜	" "	10⅛	21	30½
	60	7	" "	12⅜	25¼	32⅝
	70	9⅝	" "	15¼	30½	35¼
	80	12⅝	" "	18¾	36½	38¼

The fourth item, swinging motion, is an arbitrary distance, depending on the design of the truck, but may be assumed at 4 in., 2 in. either way from centre.

The fifth item will be the gauge, 4 ft. 8½ in., minus distance between faces of flanges. The M. C. B. standard provides 4 ft. 5⅝ in. between backs of flanges. And assuming thickness of two flanges 2⅜ in., the lateral motion will be ¾ in., ⅝ in. either way from centre.

The sixth item being isolated cases, no assumptions will be made.

Having enumerated the causes for increased width, there remains to be ascertained how the three positions of cars will be effected.

1. Required increase on outside of curves.
2. Required increase between parallel tracks.
3. Required increase on inside of curves.

Let a = ordinate = external.

b = leaning of top of car caused by elevation of outer rail.

c = leaning of top of car caused by settlement of springs = 3¼ in.

d = half of swinging motion = 2 in.

e = half of lateral play = ⅜ in.

Then the required increased widths will be:

Outside of curves = $a + c + d + e$.

Between parallel tracks = $2\,a + 2\,c + 2\,d + 2\,e$.

Inside of curves = $a + b + c + d + e$.

The accompanying table has been computed from the foregoing, which is believed to be an average railroad practice, but is not intended to defend the different theories of car construction or the variations in modern maintenance of way practice.

Conclusions.—The distances between king bolts should be from 70 per cent. to 71 per cent. of length of car.

The distance from centre of track to any permanent object on outside of curve should exceed the sum of the following five items:

One-half of width of body of car.
External projection of car.
Leaning of top of car from settlement of springs.
One-half of swinging motion allowed in construction.
One-half of lateral play of wheels on track.

The distance between centres of parallel tracks should exceed the sum of the following seven items:

Width of body of car.
Ordinate, inside of curve.
External, outside of curve.
Twice leaning of top of cars from settlement of springs.
Total swinging motion allowed in construction of trucks.
Lateral play of wheels on track.
Leaning of top of cars corresponding to *difference* in elevation of outer rails, if any exist.

The distance from centre of track to any permanent object on inside of curve should exceed the sum of the following six items:

One-half width of car.
Ordinate at centre of car.
Leaning of top of cars from elevation of outer rail.
Leaning of top of cars from settlement of springs.
One-half of swinging-motion allowed in construction of trucks.
One-half of lateral play of wheels on rails.

In the last distance, if the height of object be less than the height of car, the leaning of car at the level of top of object will be directly proportional as the heights.

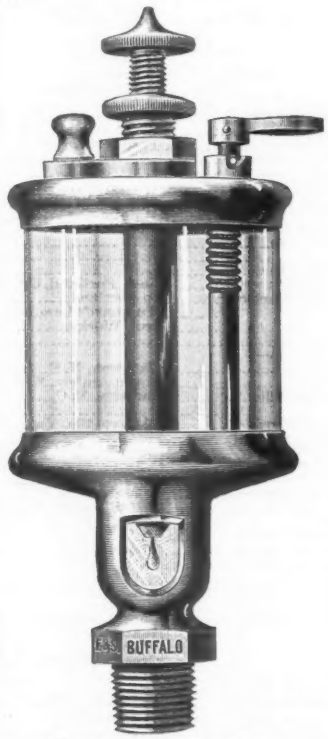
S. B. OPDYKE, JR.

NEW CONSTRUCTION, JANUARY 1 TO OCTOBER 1, 1888—Continued.

Name of Road.	Track laid between Jan. 1 and Oct. 1. From	To	Miles	Under construction. From	To	Miles
Silver Springs, Ocala & Gulf	S. Dunnellan, Fla.	Junction	1½	Dunnellan	Bridgers	17½
" " "				Junction	Homosassa	22
Silverton	Silverton, Col.	Yankee Girl Mine	5½	Yankee Girl Mine	Albany	3
Southern Pacific	Shingle Spring, Cal.	Placerville, Cal.	12			3
Stockton Tulare	Fresno	Toward Poso	67			
Santa Rosa & Carquinez	Napa Junction, Cal.	Toward Santa Rosa.	33			
Woodland C. & C. L.	Madison	Rumsey	24			
South Florida	Tampa, Fla.	Port Tampa	9			
Southern Kansas		P'nhandle City, Tex.	4½			
Somerset	No. Anson, Me.	Solon, Me.	9	Solon	Bingham	8
Staten Island R. T.	Clifton, S. I.	Richmond avenue	1½	South avenue	C. R. R. of N. J.	2½
Suburban Rapid Tr.	168th st., N. Y. City.	170th street	½			
Suffolk & Carolina	Ryland, N. C.	Montrose Landing.	4			
Suwanee River	On Hudsa Branch.		4			
Syracuse, Geneva & Corning	Penn Yan, N. Y.	Crooked Lake, N. Y.	1			
Tavares, Apopka & Gulf	Mineola, Fla.	Clermont, Fla.	2			
Tennessee & Coosa				Littleton, Ala.	Huntsville, Ala.	65
Tennessee Midland	Memphis, Tenn.	Jackson, Tenn.	85½	Jackson	Tenn. River	48
Texas, Sabine Valley & N. W.	Tateum, Tex.	Carthage, Tex.	16			
Texas & Pacific	Straun, Tex.	Palo Pinto Mines.	4			
Thomasville T. & M.	Thomasville, Ga.	Monticello, Fla.	24			
Tilton & Belmont				Belmont, N. H.	Tilton	4
Toledo, Columbus & So.	Findlay, O.	South	6			
Toledo, Saginaw & Musk.	Ashley, Mich.	Muskegon	96			
Troy & Tiptonville	Rives, Tenn.	Troy, Tenn.	5	Troy	Tiptonville	20
Tuscaloosa & Northern				Tuscaloosa, Ala.	Warrior River	7
Union Pacific	Waldo, Kan.	Colby Thomas Co., Kan.	131			
Upper Coos	W. Stewartstown, N. H.	Canada Line	2			
Valley (Ohio)	Mineral Point, O.	Coal mine	1½			
Vancouver, Klickitat & Yak.				Vancouver	Salmon Creek	10
Versailles & Midway				Midway, Ky.	Georgetown, Ky.	10
Vincennes, O. C. & Owensboro				Vincennes, Ind.	Owensboro, Ky.	70
Walden's Ridge	Clinton, Tenn.	Oliver Springs.	15			
Warrior Coal Fields				Meridian, Miss.	Gainesville, Ala.	56½
Warren & Farnesworth				Durham's Mill, Pa.	Crider's Mill, Pa.	2
Western of Florida	Belmore, Fla.	Westward	1½	Near Belmore	Starke, Fla.	16½
West Side & Mendocino	Willows, Cal.	Fruto	17			
Western Maryland				Ortanna, Pa.	Blue Ridge Junc.	15
Western North Carolina				Red Marble Gap, N. C.	Murphy, N. C.	26
" " "				Winston, N. C.	Wilkesboro, N. C.	74
West Virginia Central	Thomas, W. Va.	Parsons, W. Va.	14	Parsons, W. Va.	Leadsville, W. Va.	18
Wheeling & Lake Erie				Bowerston, O.	Wheeling, W. Va.	43
Williamstown & Del. River	Glassboro	Jefferson	5	Jefferson	Mullica Hill	1½
Wilmington & Sea Coast	Wilmington, N. C.	The Beach	9½			
Wilmington & Weldon	Scotland Neck, N.C.	Southward	12			
Manchester & Augusta	Sumter, S. C.	Southwestward	11			
Florence	Dillon, S. C.	Roland, N. C.	9½			
Winona & S. W.				Winona, Minn.	Norton, Minn.	20
Zanesville & Ohio River	Waterford, O.	Lowell, O.	12	Lowell, O.	Harman, O.	40
Zealand Valley	Zealand, N. H.	Zealand Notch	8	Zealand River	Pemigewassett	1
Total			5663½			5138

The Buffalo Glass Oil Cup.

The accompanying illustration represents a form of sight feed lubricator with an appliance for stopping the feed at any time without altering the adjustment regulating the rate of feed.



The Buffalo Glass Oil Cup.

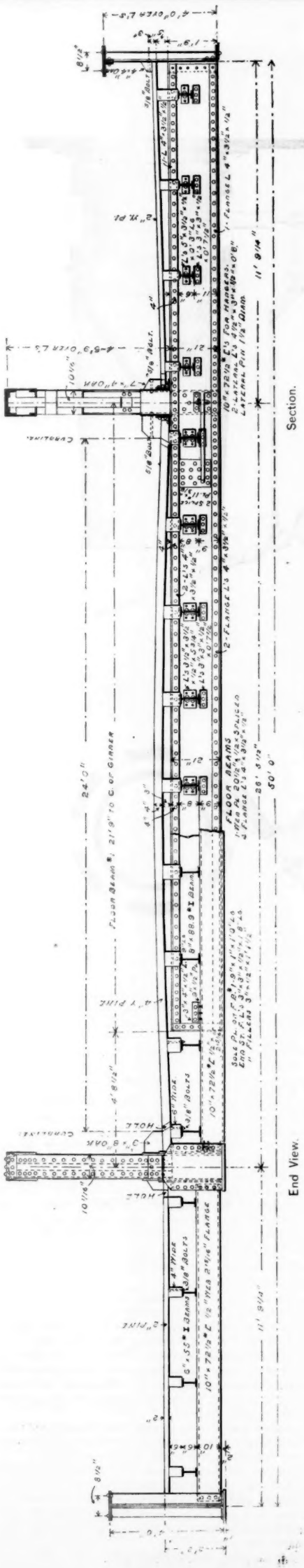
Made by MESSRS. FELTHOUSEN & SHERWOOD, *Buffalo, N. Y.*

The cup is made of glass and is filled from the top.

The feed can be adjusted to suit, and fastened with lock nut, and can then be stopped and started instantly with lever shown in the illustration, without interfering with the feed adjustment. The quick stopping and starting arrangement is entirely independent of the feed adjustment.

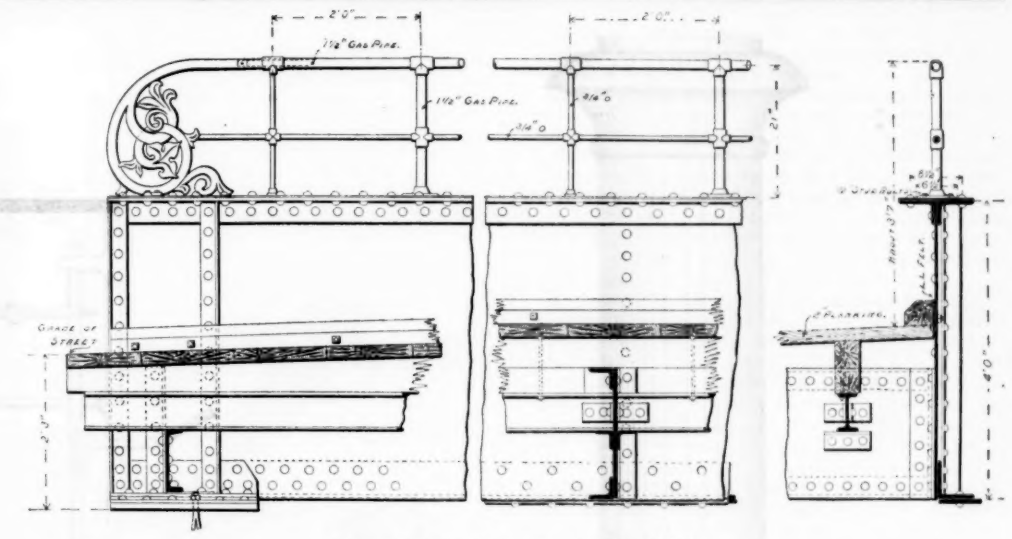
The glass lenses on sight drop can be easily taken out and cleaned, or replaced if broken, by simply unscrewing bottom of cup. The lenses, being square in shape, can be made and replaced by any one.

The makers claim that this cup is heavy and strong, has no

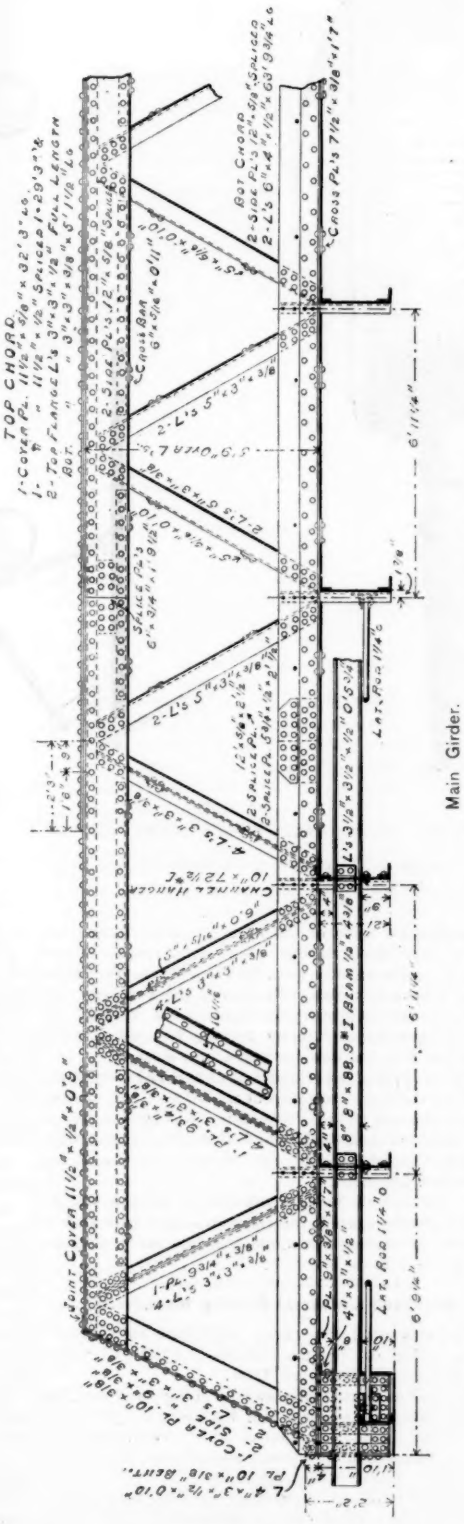


Section.

End View.



End of Outside Girder, Showing Hand Rail.



Main Girder.

ONE HUNDRED AND FIFTY-EIGHTH STREET BRIDGE OVER TRACKS OF NEW YORK CENTRAL & HUDSON RIVER RAILROAD.

loose parts, and is particularly adapted for dynamos and high speed engines for electric lighting.

Any further information may be obtained of the makers, Messrs. Felthousen & Sherwood, of Buffalo, N. Y.

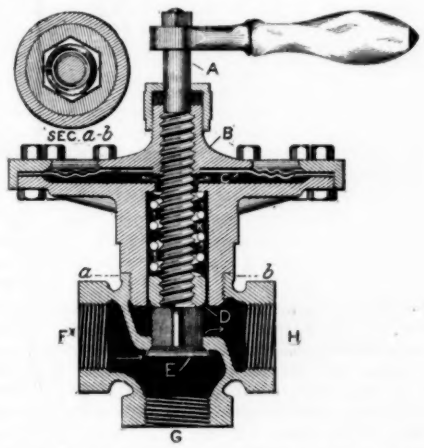
Overhead Highway Bridge—New York Central & Hudson River.

The overhead highway bridge shown in the accompanying illustrations was designed by Mr. Walter Katté, Chief Engineer, and Mr. G. H. Thomson, Bridge Engineer of the New York Central, to meet the requirements of the Park Department of the city. The railroad company has some 36 bridges similarly situated over the depressed tracks in the city, and there has been much trouble from corrosion by the gas from the engines. In the design shown here, the lower chords of the trusses are raised above the corroding line, and the floor beams are hung as shown. The bridge is of open-hearth steel and weighs 65 tons. The clear span is 59 ft. 7 in.; the length of girders 63 ft. 9¾ in. It is on a skew of 72° 31′, or 15 ft. 9 in. in 50 ft. The details are so fully shown that further description is unnecessary.

The contractors for the bridge were the Union Bridge Co.

The Foster Pressure Regulator.

We show herewith a new automatic pressure regulator, designed by Mr. J. M. Foster, of New York, which is brought forward as particularly adapted for use in continuous steam heating of trains. This regulator is now in use for trial at several establishments and has given very satisfactory results. We do not learn, however, that it has yet been applied to steam heating. It is described as follows:

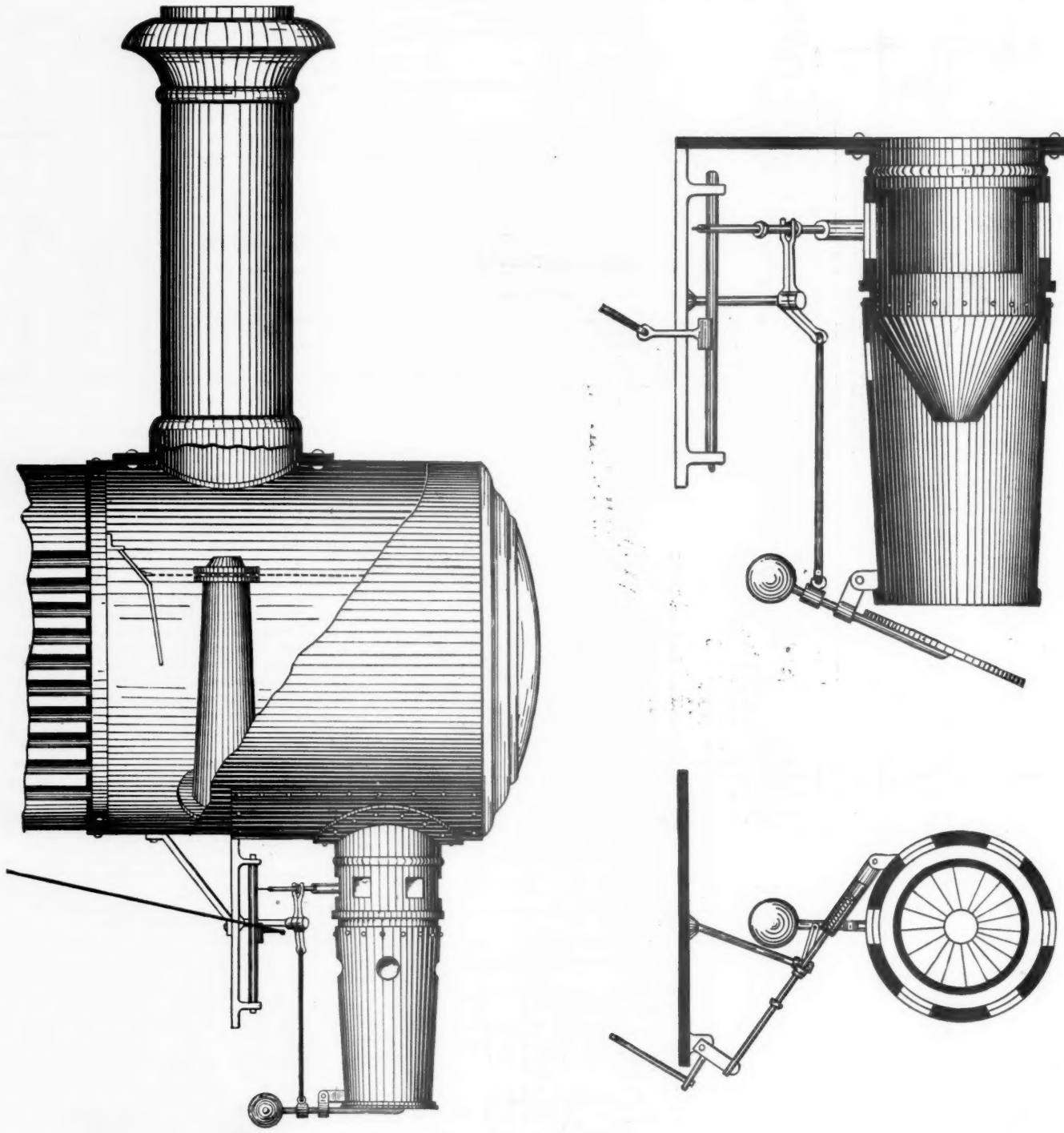


The valve body is provided with an inlet *F*, outlet *H*, and a seat for the valve *E*. The stem *A* of this valve is threaded as usual and adapted to a corresponding thread in the stuffing box *B*. The stem is provided on the outside with the usual operating hand wheel or other handle with which the valve *E* may be brought to or removed from its seat to an extent commensurate with the desired delivery pressure.

The stuffing box through which the valve stem passes, instead of being a fixed part of the valve casing, as in ordinary valves, is carried by and moved with a flexible diaphragm *C*, which is subjected to the action of the pressure of fluid on the delivery side of the valve, so that, as pressure on the diaphragm increases, the valve will be moved toward its seat. The diaphragm, which is made of brass or steel, is secured to the casing flange.

Within the chamber *K* is the spiral spring which acts on the valve and diaphragm in opposition to the steam. The upper end of this spring bears against a shoulder on the casing, while the lower end bears on nut *D*, which is threaded on the valve stem. This nut is hexagonal in shape, and the chamber in which it operates is of corresponding section, so that the nut cannot turn with the stem, but it can rise or fall with the stem when moved by the diaphragm.

It will be seen that the pressure of steam or other fluid does not depend on the tension of the spring, but upon the adjust-



SMOKE ARCH, FALL BROOK COAL CO.

Designed by W. A. FOSTER, *Superintendent Motive Power.*

ment of the valve stem. Thus, if there be an initial pressure of 100 lbs., and it is desired to have 10 lbs. delivery pressure the hand wheel is turned to a certain position, which may be determined by a pressure gauge; the pressure in the distribution pipes will then be maintained at 10 lbs. under this adjustment, notwithstanding any variation in the initial pressure. If the supply pressure increases the consequent increased pressure upon the diaphragm tends to close the valve and restrict the size of the opening at the valve seat. On the other hand, if the supply pressure decreases, the diminished pressure upon the diaphragm will allow the valve to open correspondingly. The pressure in the distributing pipes may be increased or diminished by turning the hand wheel. By screwing the valve stem far enough to the left, the valve *E* may be closed tightly to its seat and remain to entirely cut off the flow of fluid.

Smoke-arch, Fall Brook Coal Co.

The accompanying illustration represents a smoke-arch used on Consolidation and large Mogul engines on the Fall Brook Coal Co.'s lines. Both classes of engines have the same size boilers, but the consolidations have the larger fire-box.

Smoke-boxes on this principle are used on all classes of locomotives, and are found to make a material saving in the amount of sparks and cinders drawn through the flues, thus materially lessening the amount of damage done by fire along the line.

A certain amount of air can be admitted to the smoke-arch, thus diminishing the effect of the blast in tearing up the fire. These openings are situated in the hopper in the bottom of the extension, which is only about 18 in. long. As shown in the illustrations, some of the openings in the hopper are permanent and cannot be shut, while others can be opened and closed by the engineer from the cab. The hopper can be emptied of ashes by means of the door at the base, and this is generally done about every 15 minutes while running. The adjustable openings are 3 in. by 1½ in. Smaller openings were used at first, but were not found large enough.

Mr. W. A. Foster, Superintendent of Motive Power of the road, states that this arrangement works well and that no sparks are thrown, and that there is a considerable saving of fuel as compared with the diamond stack. The engines steam freely and the blast does not cut the fire. The size of the blast nozzle is unaltered.

Mr. L. Ames, of the Beech Creek road, is using a similar device for admitting air to the smoke-box, and finds that it works well, preventing sparks and lessening the cutting action of the blast on the fire.

Improved Universal Drilling Machine.

The accompanying illustration represents an improved universal radial drilling machine, made by the Universal Radial Drill Co., of Cincinnati, Ohio.

The machine as shown embodies several improvements, the most important being a new device for operating the quick return of the spindle. Numerous other improvements in details of construction have been made recently, but cannot be very clearly shown in any engraving.

The column which carries the arms, driving gear frame, etc., is bored and fitted over a stationary stump bolted fast to the sole plate. This stump has sufficient length of bearing to prevent the column from swaying, and is provided with an adjustable pivot, bearing upon an elastic diaphragm in the column, which, when the bolts in the flange at the lower end of the column are slackened, takes the weight of the machine off the flange bearing, and allows the column, with arm, etc., to revolve easily the entire circle. For ordinary drilling the bolts in the flange need not be tightened, but when extraordinary rigidity is required a partial turn of the wrench will bind the column fast to the sole plate. The sleeve which carries the arm and gear frame is fitted snugly to the column, and may be raised and lowered by power, and is provided with clamping bolts.

The table has both horizontal and vertical faces, and is provided with T slots.

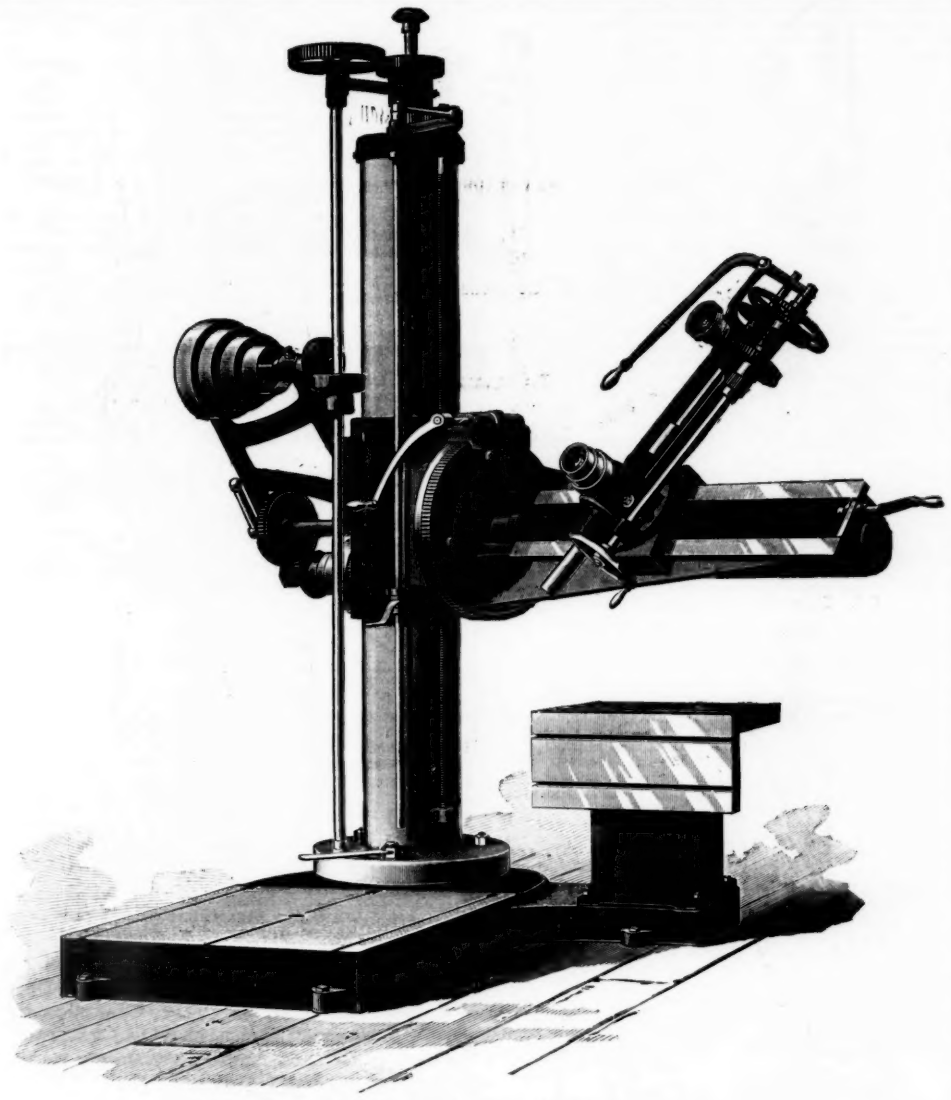
The arm and spindle frame have swivels that will revolve the entire circle, so that a horizontal line of holes may be drilled at any angle, parallel with each other, by adjusting the angle of the arm, and traversing the saddle on the arm, and a vertical line may be drilled at any angle by adjusting the angle of the spindle frame and moving the arm vertically to any point desired on the column. A hole may be drilled vertically downward, vertically upwards, or at any angle within the range of the arm.

The counter-shaft consists of a frame with horizontal shaft and T and L pulleys, and a pair of cut mitre gears to connect with vertical shaft at centre of top of column.

All gears are cut, and the bevels and mitres in arm and spindle frame are made of cast steel and cut.

The spindle, feed screw and elevating screw are made of machinery steel, and the feed worm is made of the best tool steel and hardened; all thrust bearings are provided with phosphor bronze washers.

The drill has power feed and back gear.



IMPROVED UNIVERSAL RADIAL DRILL.

Made by the UNIVERSAL RADIAL DRILL CO., *Cincinnati, O.*

The principal dimensions of two sizes of these drills are given below, but No. 1 has no quick return to spindle.

	No. 1.	No. 2.
Column, diameter...	11 in.	13 in.
" height.....	7 ft.	8 ft.
Arm, length.....	5 ft.	6 ft.
Drills to centre of circle, outside of column of.....	8 ft.	10 ft.
Sole plate to end of spindle (max.).....	5 ft. 5 in.	6 ft. 1 in.
Floor to end of spindle (max.).....	5 ft. 10 in.	6 ft. 7 in.
Total height without counter shaft.....	8 ft. 3½ in.	9 ft. 6 in.
Total height including counter shaft*.	9 ft. 7 in.	11 ft. 1 in.
Table, total height from sole plate.....	20 in.	24 in.
Table, size.....	20 in. × 20 in.	26 in. × 26 in.
Spindle, diameter...	2¼ in.	2⅝ in.
" size of hole, Morse socket, No. 4.	1¼ with ⅝ taper.	1¼ with ⅝ taper.
Spindle, traverse....	11 in.	19 in.
Counter-shaft pulleys, size.....	12 in. × 3½ in.	12 in. × 3½ in.
Counter-shaft pulleys, speed per min.	180 rev's.	180 rev's.
Width of belts on cones.....	2½ in.	3 in.
Floor space required for base.....	70 in. × 54 in.	86 in. × 60 in.
Weight, about.....	4,500 lbs.	8,500 lbs.

* To allow for the difference in the height of ceilings, a shaft 8 ft. long is furnished, with key seat whole length to connect from counter-shaft to driving wheel on top of column. This will accommodate any ceiling to 15 ft. in height.

Any further information may be obtained of the makers, the Universal Radial Drill Co., of Cincinnati, Ohio.

Retaining Walls.

BY SAMUEL M'ELROY, C. E.

Two important conditions of the stability of abutments and retaining walls are not usually found in text-book literature, and some practical notes on this subject may therefore be useful to students.

What I have to say may be explained at the outset, as having no reference to dry wall masonry, which the common sense of the profession should have condemned long ago, as a mistaken economy, which has often been fruitful of expensive and troublesome failures. I have had occasion to demonstrate, from time to time, the errors of this practice, especially in hydraulic works, even on a question of first cost; and yet, for the matter under discussion, and as a test of formulæ, dry walls, on a large scale, have actually been built, and put under working test.

Every experienced engineer and architect knows that the usual text-book theories of abutment or wall bank thrust above the "slope of repose" are of little value, and we have all seen in our experience absurd dimensions adopted by tyros, clothed with brief authority or interested in percentage of cost. Our railroad and other embankments and cuts are formed on this slope, properly and wisely, because they are exposed to weather action and other contingencies which require this precaution, and the absolute protection of a track in a cut is imperative.

But for purposes of construction no attempt is made to observe it, and in many cases plumb cuts are used, even for deep structures, very often without temporary shorings. What is more common in city buildings than an excavation, even to double basement depth, and foundation wall built, without shoring or sheet piling, and how many such buildings have foundation walls proportioned even to one-half the usual retaining wall thickness? Walls of 36 to 42 in. in width in common rubble masonry on a foundation course of 48 to 60 in. are common, even for very costly superstructures, although it must be admitted that our city architects are running into an opposite extreme now, with walls so uselessly massive that they crack valuable fronts, as built on unprepared earth. The entire traffic of Broadway between its curbs is carried on over a porous bed of coarse sand, supported 18 to 20 ft. deep by vault walls usually about 2 ft. thick.

One of the traditions handed down from one generation to another of working engineers, founded on accumulated experience, is the general law that a masonry wall should have a thickness of about one-third its height. This does not mean, in rule or in practice, that such walls should be parallelograms in section, but, interpreted by custom, for a broader base and narrowed head, the rule is a safe one for any well-built rubble masonry, with a safety factor increased by work closer bonded and more compact in brick or coursed work.

In our general plans of the Erie Canal enlargement of 1851-2, bridge abutments were made for the extreme berme bank, height of 19½ ft., about 5 ft. base, stepped to 3 ft. head, with wing walls about 3⅜ ft. base and 2½ ft. head; and these walls, in the large cities, were subject to very heavy traffic at times.

For railroad road bridges of the same height I have usually made the base 5 to 5½ ft., and with a face batter of one in twelve, brought the back, in steps, to 3 or 3½ ft. head, with 30 in. or 3 ft. coping (4 or 6 in. blue stone), which all such walls should have to distribute the bridge strain and protect the joints.

Trautwine makes the general rule of thickness 35 per cent. for "cut stone or first-class large ranged rubble," 40 per cent. for "scabbled rubble or brick," and 50 per cent. for "well scabbled dry rubble," the latter a practical comment on cost of bad walls, which is much more per yard for selection, dress and handling than in cement. Why he classes first-class brickwork with ordinary rubble, in view of experience, London underground and elsewhere, I do not understand, but his rule, which is subsequently increased, is more than safe for ordinary conditions.

In the "London underground" practice, as, for instance, at Earl's Court Station, in a sand and gravel formation, the retaining wall, about 23 ft. high, had to support, on the northwest side, not only its bank load, but, with a face about 2 ft. back of it, a brick building, 35 or 40 ft. high, by about 30 ft. face. This was done by building in brickwork piers 3 ft. face, 11 ft. between centres, about 7 ft. deep at base and 5 at top, with arched bays, the main wall being 4 ft. thick at base, and 2 at top; the piers and wall, resting on a concrete base 10 ft. wide by 2 thick.

At the Mansion House Station, in the heart of the City, a wall 32⅛ ft. high in the clear, also supporting a building about 70 ft. high, has a concrete backing, vertical at the rear, about 7 ft. base and 4 top, faced with thin brick work in the bays, 9 to 18 in. thick, brick piers being 5⅝ ft. deep at base and 6⅛ at top, with vertical pier faces; the whole resting on a concrete base 12⅝ ft. wide by 2⅛ deep. In this case, the soil is first, 10 ft. made ground, then sand and gravel 19 ft., and the doubtful London clay below.

These walls, which have stood most admirably, and abundant other cases, illustrate the highest type of engineering skill in securing ample safety, with great economy of space, materials and work, which was the result of elaborate experimental investigation at every step to meet most formidable difficulties. No engineer interested in such constructions can spend sufficient time in London to study this work, much of it far below high-water saturation, often in treacherous soil, beside and under most massive and costly structures, under churches and cemeteries; beside and under old and surcharged sewers, across and under streets and squares of heavy traffic, in such a city as this, without feeling that Messrs. Fowler, Baker and Cooper had each well earned a nook in Westminster Abbey, when their skillful lifework is done.

Leaving a field of practical illustration which might be indefinitely extended, enough has been said to introduce the the two-fold precautions referred to at the commencement.

Prepared Foundation is the first suggestion. The actual earth bed itself is an essential point in stability of structure, too often neglected in commencing walls. In what engineering or architectoral specification is it required that this bed shall be carefully leveled off and prepared, and rammed solidly home. One sometimes sees elaborate structures commenced on loose ground, often in cases where a foot of dry sand, carefully packed, with its 30 per cent. shrinkage, would properly sustain the massive concrete beds used above it, and seriously reduce their cost, while large masses of the fashionable Portland cement of the day are not permanent or stationary for a while, as they are usually assumed to be.

In building the main engine house of the Brooklyn Waterworks, with a massive stoop and heavy front wall, over the aqueduct gate chamber, where at one central depth there was a solid brick structure which could not be extended sideways along the building front, I backfilled the aqueduct arch with clean sand for several feet in height, in well rammed and thin layers of uniform level, to the base of the other foundation walls, under personal inspection, floating that part of the building in this way. I have never noticed any settling on this front, while an attempt to support the central front on the aqueduct chamber would have been quite sure to introduce very unequal strains on a foundation of changeable saturation.

One of the most prominent advantages of trench concrete foundations lies in obtaining a uniform bearing, if the concrete is properly rammed in thin layers, with proper time to set. If this is so, certainly a carefully prepared bed for the concrete is no less essential, and sand, well rammed, furnishes such a bed admirably.

Any careful study of the failures which have occurred in retaining and dock walls shows that they are rarely to be attributed to defective masonry sections and have generally occurred through defective foundations. Saturation and pressure, or pressure without it, have caused foundation yielding or sliding, and with this, the best built wall must go. All clay foundations need care in preparation, some of them special care. At Albany, with about 400 ft. of solid blue clay foundation on the hill, the portico of the State House settled after construction, because the clay bed, losing its usual supply of moisture, dried and shrank enough to cause this result. For the Capitol extraordinary precautions were taken to construct a massive concrete bed, but various springs were cut off and the clay bed was not drained, and the millions of dollars spent like water have not saved that structure from unfortunate injuries.

It is the foundation of the foundation, then, which requires an engineer's special care in plan, specification and inspection.

As entirely germain to this point, it must be added that all wood bearings are to be avoided, except in extreme cases. An engineer may, as was our case at the Brooklyn Navy Yard, be obliged to pile most of his foundations, but there we excavated carefully around and well below the heads of the piles, and made a thick bed of concrete around them, on rammed sand, so that the walls would have a broad masonry foundation, when the wood decayed, with the chances of undisturbed set in their favor.

One meets here and there some remarkable engineering theorems on the durability of wood, and especially under water. The cases which sustain them are the exceptions to a rule of consistent destruction. An oak tree, intact, even to its acorns, in an enormous peat swamp, certifies to the indestructibility of timber, when one does not pause to think what filled the swamp, and in the ground, alternately wet and dry, no permanent walls should rest on wood.

Careful *frost protection* is the second condition of stability,

and ice crystals are fatal to carefully constructed formulæ in front of slopes of repose, because they do not repose in confinement.

Bridge abutments, as a rule, are short enough to drain their banks very well, but those behind longer walls may be dangerously saturated with water, and, if not actually frozen, develop powerful hydraulic pressure for a body far back of the wall itself.

It may be claimed that walls more than 4 ft. thick will not carry frost to the bank behind them, but, though stone and earth are slow conductors, long continued frost will penetrate deeply, and in certain storms water at about freezing point may be carried to considerable depths along the wall.

At all events, it is a simple matter in construction to guard the immediate backing of any retaining wall by the use of what I have usually specified as "frost lining," which acts as a constant drain on the bank, and makes a material improvement in its condition, and reduction of its weight at all times.

Without further discussion, the following extracts from railroad specifications will define, on these points, the methods used on several lines and various structures to secure stable foundations and dry back fills.

"*Foundations.*—All wing walls, abutments, and similar structures, if on rock, are to have the beds spalled and squared to make a firm and equable bearing for the foundation stone or concrete specified; if on sand, or sand and gravel, the beds are to be well and carefully rammed after being dressed to a level with mauling plank and heavy paving mauls; if on moist or loamy earth or clay are to have dry sand spread, and well rammed in like manner, in 6 in. courses to make a final bed, not less than 12 in. thick, of full trench width. No masonry to be laid on soft or unprepared beds; the wall foundation base to be, in all cases laid in a full bed of mortar.

"*Frost Lining.*—All walls, back fil'ed with earth, to have near gutter or drain grade, through drain ports not less than 6 in. square, at intervals not exceeding 30 ft.; the wall from these ports upward to be filled in on the back, as it is built, with a frost lining of selected gravel, or small stones, concrete size, not less than 18 in. wide, to within 3 ft. of top of wall."

Hand Signals.

The work of preparing a set of illustrations showing the standard signals, as prescribed by the uniform code, which the Train Rule Committee of the Time Convention has been directed to undertake, will doubtless include the hand and lantern signals, which are already the subject of illustrations in the official copy of the code, and the accuracy of these illustrations is, therefore, a point of interest. As there is some difference in practice and interpretation, we show herewith some figures taken from the time-table of the Chicago, Santa Fe & California, and with them, for comparison, those shown in the official code. The figures lettered *A* show the day motions of the road named, those lettered *B* the night motions, and those lettered *C* the day and night motions of the uniform code. Some points of difference are noted in another column.

1 A. Go Ahead—Day. 1 B. Go Ahead—Night. 1 C. Go Ahead.

2 A. Stop—Day. 2 B. Stop—Night. 2 C. Stop.

3 A. Back Up—Day. 3 B. Back Up—Night. 3 C. Back Up.

4 A. Train Parted—Day. 4 B. Train Parted—Night. 4 C. Train Parted.

HAND AND LAMP SIGNALS.

The figures in the third column are the same as those shown in the Uniform Code.

TECHNICAL.

Locomotive Building.

The Chicago, St. Paul & Kansas City has recently received from the Rhode Island Locomotive Works five passenger and five Mogul engines. The company has also received from the Cooke Locomotive Works, Paterson, N. J., 12 Moguls and five passenger, and eight Mogul locomotives are still to be constructed for the road by the latter company.

The Hinckley Locomotive Works, at Boston, have just completed a number of six-wheeled switching engines for the Chicago & Eastern Illinois, and are now at work on orders for Mogul locomotives for the Illinois Central and the Alabama Great Southern. Those for the latter road were designed by Superintendent of Motive Power James Meehan, and have 19 × 24 in. cylinders and wheels 54 in. in diameter, and will weigh when in working order 103,000 lbs. The boiler will be of the wagon top type.

Car Notes.

The Boston & Maine has just let contracts for 20 passenger cars, the order being divided with the Laconio (N. H.) Car Co. and Osgood, Bradley & Sons, of Worcester, Mass.

The 30 passenger cars which the New York & New England is building at the Norwood shops are now nearly all completed. They are 60 ft. long outside of the end sills, and 9 ft. 8 in. wide outside of side sills and 10 ft. 5 in. from the under side of sill to top of roof They are mounted on two four-wheel trucks and 7 ft. wheel base, and have steel-tired Paige wheels, M. C. B. axle and journal box, and the Ross-Meehan shoe. They are also fitted with the quadruplex elliptic concave spring for bolster springs, the Hale & Kilburn seat arm and the Russell & Irwin door check.

Pennock Bros., of Minerva, O., are building 400 coal cars for the Cleveland & Canton.

The Barney & Smith Manufacturing Co., of Dayton, O., this week delivered 18 passenger cars to the New York, New Haven & Hartford, which completes the company's order from that road.

The Southern Iron Car Line, of Atlanta, Ga., recently placed in its service 100 60,000-lb. box cars to run between points south, west and north. They were constructed under the patents of the Iron Car Co. of New York with steel and iron frames, but with the ordinary box.

The New York, Lake Erie & Western is having 20 new express cars built.

The Lafayette Car Works are at work on an order for 100 refrigerator cars, which will keep them busy for some weeks.

The Indianapolis Car Manufacturing Co. is building 1,000 box cars for the Chicago, Burlington & Quincy, which it is to have delivered by Feb 15. They have still 300 cars to build for the Atchison, Topeka & Santa Fe. The company was asked last week to bid on 1,000 box, 500 coal and 100 refrigerator cars for the Union Pacific.

The Kansas City, Memphis & Birmingham this week received another consignment of ten gondola cars from the Barney & Smith Mfg. Co., of Dayton, O.

The Birmingham Mineral has received 15 60,000-lb. ore dump cars from the Louisville & Nashville shops at East St. Louis, Ill.

The Old Colony will build 30 new passenger cars.

Bridge Notes.

A large iron bridge is to be constructed across the Spokane River near Spokane Falls, W. T., at an estimated cost of $42,000. The bridge will be a cantilever, 36 ft. wide and 100 ft. above the water.

The Berlin Iron Bridge Co. has contracted for the building of an iron bridge at Salisbury, Mass.

An iron bridge across Rock River near the northwest end of Washington, D. C., was completed this week. It is nearly 400 ft. long and 50 ft. above the water level, and rests on stone piers.

It is stated that the Chicago, Burlington & Quincy will build a bridge across Rock River at Sterling, Ill., at a cost of $25,000.

The works of the Columbia (O.) Bridge Co. were destroyed by fire on Nov. 1. The loss is estimated at $20,000, with light insurance.

The following proposals were received for building a bridge across Gowanus Canal, Carroll street, Brooklyn: Riverside Bridge and Iron Works, work complete, $11,372; Charles McDonald, plan 1, complete, $9,910; Charles McDonald, plan 2, complete, $8,950; King Iron Bridge and Manufacturing Co., work complete, $6,000.

The American Bridge Co., of Sacramento, Cal., has been awarded the contract for building a bridge over the Mokelumne River, at Benson's Ferry, Cal. The price is $6,450.

It is proposed to construct a new bridge across the Connecticut River at Brattleboro, Vt., at a cost of $13,000.

The Hilton Bridge Co., of Albany, N. Y., has been awarded the contract for building an iron bridge across Wells River, at Centre Rutland, Vt.

A new iron bridge is being built at Chestnut street, in Clinton, Mass.

The San Diego (Cal.) Supervisors will receive bids for a bridge across the San Diego River.

The following bids for constructing the wrought-iron bridge over Hunt street, in Cincinnati, O., were received by Board of Public Works: Indiana Bridge Co., $16,000; King Iron Bridge Co., Cleveland, O., $13,423.57; T. J. P. Brockett, Covington, Ky., $13,200; Wrought Iron Bridge Co., Canton, O., $13,160; Columbus Bridge Co., $12,903; Queen City Bridge Co., Cincinnati, O., $11,971; Variety Iron Works, Cleveland, O., $11,588.

The Toledo, St. Louis & Kansas City will soon let the contract for a 900 ft. iron bridge to span the Wabash River near Silverwood, Ind.

The new five span steel and iron bridge of the St. Louis, Vandalia & Terre Haute, over the Wabash River near Terre Haute, Ind., has been completed.

Manufacturing and Business.

The American Engineering Co., of Alliance, O., has just delivered to the Minneapolis, St. Paul & Sault Ste. Marie road a 1,250-lb. steam hammer. The company has also equipped the South Park shops of the Chicago, St. Paul & Kansas City with a 1,500-lb. steam hammer.

The Springfield Glue & Emery Wheel Co. recently purchased 32 acres of land near Minerva, N. Y., which contains large beds of garnet rock. Ninety tons have already been mined and delivered to the company at Springfield. The rock is very hard, and when crushed each particle has very sharp edges, so that for cutting it is superior to ordinary sand paper. The mine is large and will last for years, and the facilities of the company will be greatly increased.

The Laidlaw & Dunn Co., of Cincinnati, O., were awarded a medal for their standard "Duplex" steam pump at the Cincinnati Centennial Exposition. The company also received a number of other medals for their exhibits.

The Waterhouse Electric & Manufacturing Co., of Hartford, Conn., was awarded a gold medal at the Cincinnati Centennial Exposition and two silver medals, covering the arc light plant at the exposition. This is the second gold medal awarded to the Waterhouse Co., the first being received from the Mechanics' Fair, Boston, in December last.

Among recent sales of bolt cutters by the Acme Machinery Co., of Cleveland, O., are the following: Duluth & Iron Range, Worthington Pump Co., California Southern and California Central; Grand Trunk (four machines), Youngstown Car Mfg. Co., Schenectady Locomotive Works, Pennsylvania, Eastern of Minnesota, Northern Pacific, Richmond, Fredericksburg, & Potomac, J. H. Sternberg & Son (two large machines for the shops of the firm at Reading, Pa., and Kansas City, Mo.), Pillow & Hersey Mfg. Co., Montreal; Atlantic Works, East Boston, Mass.

Among recent orders for Hussey re-heaters (which re-heat exhaust steam by means of the waste gases of combustion on their way from the boilers to the chimney) filled by the Hussey Re-heater & Steam Plant Improvement Co. of New York, are heaters for some of the largest office, apartment buildings and hotels in New York. The company has also filled orders for factories at Fishkill Landing, N. Y.; Haverhill and Holyoke, Mass.; Erie and Phillipsburg, Pa., and Brooklyn, N. Y. The Sewall & Day Cordage Co., of Boston, Mass., have ordered both a Hussey re-heater and a compound automatic low pressure feed-water heater, for use in their new factory at Brighton, Mass. Both apparatus are to

be placed in the main flue between the boilers (aggregating about 1,000 h. p.) and the chimney, which is about 175 ft. high. The two boilers have an aggregate weight of 24,000 lbs.

The Inter-state Railway Construction Co., organized for the purpose of constructing and equipping railroads, has filed articles of incorporation in Colorado. The capital stock is $100,000. Denver is the headquarters of the company. The incorporators are: C. E. Gallagher, D. L. Williams, Noah Hardy, Charles H. Morton, J. M. Bell, D. M. Frost, W. W. Watson, E. S. Chenweth, R. W. Evans, J. H. Finlory, Hill P. Wilson.

Iron and Steel.

The Union Steel & Iron Co. has been organized to succeed the Union Steel Nail Co., and the rolling mill plant will be removed from Omaha, Neb., to St. Joseph, Mo., and greatly enlarged.

The Oregon Iron & Steel Co. has started up it new furnaces at Oswego, Ore., and also the iron pipe foundry.

The Wheatland Iron Co., of Wheatland, Pa., started up part of its plant last week, and it is expected that all departments will soon be in full operation. Skelp iron of large size will be the principal product.

D. S. Mathias has been appointed Superintendent of the South Chicago Works of the North Chicago Rolling Mill Co., to succeed J. W. McGinnis, who resigned a short time ago.

Manning, Maxwell & Moore, New York City, have the contract for the entire equipment of the new shops of the Louisville & Nashville road at Decatur, Ala.

Fay & Scott, Dexter, Maine, have recently filled orders for machine tools for Mexican railroad shops.

The Rail Market.

Steel Rails.—A Southwestern road is in the market for about 50,000 tons of rails, part for immediate delivery. Roads in the southern and south Atlantic States have placed orders for rails aggregating between 30,000 and 40,000 tons. The terms were not made public.

It appears that the order given by the Vanderbilt roads was as follows: 17,000 tons for the New York Central and West Shore, 8,500 tons for the Lake Shore and Pittsburgh & Lake Erie, 6,500 tons for the Michigan Central, 5,000 tons for the C., C., C. & I., and 3,000 tons for the N. Y. C. & St. L., a total of 40,000 tons. Three-quarters of this, the Western business, went to Pittsburgh and Chicago mills, the former taking the bulk of it.

It is stated that the new Pittsburgh mill is taking orders at very low terms, and if the mill is able to turn out a large product and make a fight for business, some demoralization in rates may result. The market is irregular, but quotations reemain $27.50@$28, though desirable orders could be placed at $27.

Old Rails.—Very little business is reported, and the prices continue at $23@$23.50.

Walnut Grove Dam, Arizona.

At a recent meeting of the Technical Society of the Pacific Coast, Mr. Luther Wagoner read a short description of this great dam, which is 110 ft. high at the middle and 400 ft. long.

This dam is on Hassayampa Creek, about 35 miles south of Prescott, Ariz. The drainage area above the dam is 390 square miles; annual rainfall not known, but supposed to average 16 in. The dam was built to store water. Some pine timber growing at an elevation of 6,000 to 8,000 ft. on the Bradshaw Mountains is the only available source of lumber supply, but the quality is very poor, knotty and unsound, and very brittle. The country rock at the dam site is a coarse-grained granite, easily quarried. The high price of good lumber, cement and supplies determined the choice of methods of construction.

Work was commenced on the dam by Prof. W. P. Blake, who carried a wall across the cañon to bedrock through about 20 ft. of sand and gravel. What his intentions were to do next is not known, as no records were made or kept by the company's officers at the dam. He was succeeded by Col. E. N. Robinson as chief engineer, and the work was contracted for by Nagle & Leonard, of San Francisco. Under Colonel Robinson the dam was commenced in the rear of the Blake wall, and was described in the specifications as being composed of front and back walls 14 ft. at the base and 4 ft. at the top, with loose rock filling between. The dam to be made water tight by a wooden skin or sheathing.

Quarries were opened by the contractors upon both banks of the stream above the top of dam. The stone was loaded upon cars, having the bed inclined at about 15 deg., and were lowered on the dam by a bull-wheel and brake, a three-rail railroad being laid on trestle across the dam, height from 10 to 15 ft. On the slope midway was a turnout so as to allow the loaded car to pass the empty car. The loaded car was unhooked on the level and run out and dumped and returned above by the next loaded car. The legs of the trestle were left in the wall; only the caps and stringers were raised. During the first stages of construction derricks were used to distribute the larger stones; later the centre was kept high and the stones for the wall were moved by bars. The effect of this upon the stability of the dam is bad because it tends to form curved beds whose slope makes an acute angle with the direction of the resultant pressure.

Cedar logs 8 to 10 in. in diameter, by 6 ft. long, were built into the wall on the upper face, and projected out 1 ft. Vertical stringers 6 in. × 10 in., of native pine, were bolted to the logs; the stringers were about 4 ft. apart; at the joints of the 6 × 10 stringers a cedar log was built in the wall about 2 in. above the top of the stringers, and two 4 × 10 splice pieces bolted through the log and spiked to the 6 × 10 pieces with galvanic boat spikes, completed the joint. Upon the main wall of the dam a double planking of 3-in. boards was laid, having a tarred paper put on with tacks between the planks. The outer row of planks was calked with oakum and painted with a heavy coat of paraffine paint (refined asphaltum, or maltha dissolved in carbon bisulphide). The junction of the plank skin and the bed rock was secured by Portland cement.

Through the dam is a culvert 3 × 4 ft. inside about the level of the old creek channel; this is boarded with 3 in. plank inside and has a gate to draw off the water and waste it. (See fig. 1.)

With 70 ft. of water above bed-rock the dam leaked 141 in. (1.6 cu. ft. = 1 in.) Various theories were advanced for the cause of the leak; one was, that settlement of the dam had forced an opening of the junction of the inclined and horizontal skins; and another was, that it leaked all over the whole surface. The extreme right hand skin below the bed of the stream is made of but one plank. The machinery for draining the water was inadequate, and the men who did the cementing to bed rock assured me that they worked in 4 ft. of water, and that they did not go to bed rock, while per contra the sub-contractor, "Whoop 'em up Jack," for the work assured me that it was well done. The probable cause of leakage, I believe, is all three of the reasons named.

The contract for the dam proper was for 46,000 cu. yds., lumped at $2.40 per cubic yard. The skin and cementing was extra. Lumber cost about $15 at the dam; $2,000 freight was paid on $1,000 worth of cement purchased in San Francisco.

Labor was quite unreliable, perhaps owing to the presence of saloons and gambling shops, and the totally inadequate provision made for the comfort of the men by either the company or the contractor. This coupled with the intense heat, poor water and food, did not offer to sufficient inducements to attract a sober and reliable class of workmen, a point too often overlooked in the construction of a large work.

Paradise Cut Dam.

Work has been begun on the great overflow dam in Paradise Cut, 15 miles south of Stockton, Cal., in the San Joaquin River. The dam will be 250 ft. long and 40 ft. high, and will be of timber, with earth filling. The purpose is to keep the current of the San Joaquin in the main channel, thus scouring it out and aiding navigation.

Why are Rails Free from Rust?

Prof. W. Spring believes that the apparent immunity from rust of rails in active service, while unused rails soon become thickly covered with rust, is due to the combination, under the pressure of the wheels, of ferric hydrate with the iron of the rail, thus forming magnetic oxide, which protects the iron from further action. This theory is supported by the results of experiments in which thin iron plates were covered with moist ferric hydrate and the mixture subjected to 1,000 atmospheres pressure. The ferric hydrate was blackened and adhered strongly to the plates, which were corroded; the substance next the iron of the plates was found on analysis to be at least in part magnetic oxide. The conditions of the experiment were such as are actually present in the case of rails: the rust which forms on the rails after a rain or during damp weather has rarely the time to become dry before the passage of a train converts it into magnetic oxide. For further proof, the scales on that surface of a rail which received the greatest pressure were removed by the aid of a brass wire brush and submitted to analysis. They were found to be composed of magnetic oxide mixed with a variable quantity of ferric oxide and apparently a small proportion of free iron.

Heating Cars on the Old Colony.

Mr. J. N. Lauder, Superintendent of Rolling Stock, Old Colony, has fitted up four very old and weak locomotives as portable steam boilers, for the purpose of keeping steam-heated cars warm at way stations before the regular locomotives are attached. At Dedham, Mass., station, on their Providence division, a number of suburban trains lie over night. These four ancient engines, with rear steam pipes, and with branch lines of 50 ft. of hose extending from each side, are coupled to three trains of cars at a time, and can thus warm a dozen trains at once while standing in a yard. The engines being portable solve a vexatious problem.—*Railway Review.*

Communication between Engineers and Firemen.

The "Colonel Scranton," a locomotive recently rebuilt from a wood burner to a culm burner at the Delaware & Lackawanna shops at Scranton, has a new feature that will be a decided convenience to the enginemen. Heretofore the engineer and firemen of locomotives of this make have had difficulty in conversing with each other, owing to the fact that they are so far apart, but this trouble has been obviated in the "Colonel Scranton" by the introduction of an alarm bell and speaking tube, which render prompt communication possible. The important improvement was introduced by the Master Mechanic, Mr. Charles Graham, and this is the only engine in the country that has such an outfit.—*National Car-Builder.*

A New Type of Ferry Boat.

The "Bergen," a double-ended propeller, designed for service on the Hoboken and New York ferries, was recently launched at the ship yards of Thomas C. Marvel & Co., Newburg, N. Y. While not in all respects a novelty, the boat marks a distinctly new departure in naval engineering. Hitherto all the ferry boats in these waters have been driven by side wheels. These lend themselves very perfectly to double-ender propulsion, it being practically immaterial as regards the perfection of their action whether they drive the boat in one direction or the other.

In the new boat the motive power of the screw has been adopted, and has been applied to the same type of vessel. A shaft is carried the entire length of the hull, emerging at each end. To each of the ends a screw, both of identical pitch and diameter, is secured. In advance of each screw a rudder is placed, provided with the usual pin for holding it fixed when made to constitue the bow end of the boat. As seen from the outside, each end of the vessel appears precisely like the stern of an ordinary propeller.

A single engine is provided to drive the screws. Both, therefore, have to rotate together and at exactly the same speed. They propel the boat by the pulling action of the leading wheel and the pushing action of the rear one.

By their use several important results are achieved. The most obvious ones relate to the increased deck room. Her engines will be entirely under deck, a space of two feet intervening between their highest parts and the deck planks. The smoke stack is to be elliptical in section, to save width. On account of these features of construction, the central deck house is about two-thirds of the length, and 2 ft. narrower than usual. The cabins will be unobstructed by the paddle boxes. The narrow gangway leading fore and aft will be dispensed with, and the area will be clear of encumbrance from front to rear. These changes, it is calculated, will give an increase of capacity of twenty per cent. for trucks and carriages and thirty-five per cent. for passengers.

It has been found by experience that a tug boat can cope quite effectually with the ice that packs in the ferry slips, and one has often been used for the purpose of clearing them of ice. The new boat will, it is anticipated, prove most effectual in this regard. Paddle wheels can only drive ice about twenty feet, but screws are far more effectual. As the new vessel enters a slip, her forward screw will start currents of water that will carry the ice past her sides, to be driven out into the river by her after screw.

The "Bergen" has fine lines, her ends being very sharp, giving good entrance and run. She is 200 ft. long, 62 ft. over the guards, 32 ft. width of hull, 17 ft. deep, and will draw from 9½ to 10 ft. of water. She is of steel throughout. She is to have two tubular boilers, 8 ft. dia. by 23 ft. long, to work at 160 lbs. pressure. Her engine is of 24 in. stroke, triple expansion, with 18½, 27 and 42 in. dia. cylinders. The shaft varies from 8¼ to 8¾ in. dia. The screws are 8 ft. dia. by 9 ft. 3 in. pitch. They are alike on both faces, so as to cut both ways with equal efficiency.

White Iron Paint.

The Brainard Paint Co., of Chicago, make by a new process a paint which is claimed to have unsurpassed lasting qualities. The base of the pigment, white iron, is so combined with linseed oil that it is said to hold its gloss and color and improve with age. It does not peel off, is made in all colors and is being extensively used for bridge and car painting.

The Russell Snow Plow.

This snow plow is in use and adopted on various roads in Canada and New Brunswick, but until now has not, we believe, been brought to the attention of railroad officers in the United States. It is said, however, to have been very satisfactory when tried. It is not a machine plow like the rotary, but is of the type long in general use, with the addition of "elevators" in the rear of and attached to the usual wings. These elevators are additional wings, each presenting three concave surfaces, which are set at an angle of about 30 deg. with the horizontal, and can be set out to clear a cut 16 ft. wide. The trucks are specially designed for the service, with journal bearings inside and outside of the wheels. The bearing is so large that heating of the journals is said to be entirely avoided. Mr. J. W. Russell, 53 State street, Boston, is the owner of the patents, and full particulars can be had from him.

The Paris Exposition.

The final allotment of space for exhibits at the Paris Universal Exposition takes place on Nov. 15, and the shipments by steamer will begin in January. The amount of space allotted to the United States is being applied for rapidly by manufacturers throughout the country. According to the provisions of the French Government, there is to be no charge for space occupied by exhibitors. The commission appointed by the United States government will forward and return, free of freight, all articles received for exhibit.

The exhibition is to be divided into nine groups—works of art, education and processes used therein, plain and decorative house furniture, textile fabrics, raw and manufactured products of the mines, forests, chemistry, etc., apparatus and methods of mechanical industries, food products, agriculture, vine culture, fish culture and horticulture. The offices of the commission are at No. 35 Wall street.

The West Point Tunnel.

The work of reconstructing the West Point tunnel of the West Shore Railroad is progressing slowly. There is much trouble with fresh falls of loose material. The repairing gangs work in shifts in either approach night and day, but only 15 men can find room to work together. They have not yet dug out the two cars loaded with passengers' baggage and express goods that were caught and crushed when the cave-in occurred.

THE SCRAP HEAP.

Notes.

It is reported that 23 Grand Trunk conductors have been indefinitely suspended at Hamilton, Ont., as the result of investigations by detectives.

The withdrawal of the Missouri Pacific from the management and control of the Missouri, Kansas & Texas has led to the removal of the hospital hitherto maintained by the former company at Sedalia, Mo. Twenty patients were removed to Independence, Mo., where temporary quarters have been provided.

The brakemen on the California Southern and California Central, at San Bernardino, Cal., struck on Nov. 2, the grievance being the promotion of new men over old.

On the Huntingdon & Broad Top road, Nov. 3, 14 employés were riding down a steep grade on a hand-car when a wheel broke, throwing the men in all directions. Five men were killed, and a following hand-car was stopped barely in time to prevent a second wreck.

On the Louisville, St. Louis & Texas, near Owensboro, Ky., Nov. 4, three Italian laborers were killed by "a hand-car running into a construction train."

Proposed New Harbor at St. Petersburg.

A special commission has been appointed by the Russian Government to consider the construction of a new harbor for St. Petersburg, the necessity for one having become imperative since the military authorities have claimed the port of Cronstadt for military purposes solely, and are demanding the exclusion of mercantile vessels. The new harbor on the plans prepared by the ministry of communications is to be constructed at the Gutujeff Island, and be in direct communication with the Russian railroad system. It is intended to accommodate at least 50 steamers and 100 sailing vessels, the cost being estimated at about £600,000.

The Trans-African Railroad.

A dispatch from St. Paul de Loanda says that the first section of the Trans-African railroad from St. Paul de Loanda to Ambaca has been begun.

Englewood Station—Northern Railroad of New Jersey.

This new station is described as one of the handsomest in the suburbs of New York. It is of native stone up to the first story, then white pine, half-timbered, to the roof, which is of slate. The trimmings are of terra-cotta. It is surmounted by a tower 70 ft. high. Two covered platforms, each 30 ft. long, are built at either end and a covered driveway in the rear. The window glass is double in the lower sashes, the upper part being of colored glass. The general waiting room is 30 by 62. The ladies' room, 13 by 16; ticket office, 13 by 18; baggage room, 12 by 18; toilet rooms, 6 by 11. An extra room over the office is 13 by 13. The interior is of Georgia pine. In one end of this room is a massive mantel of pressed brick and terra cotta. It will be lighted by gas and heated by the Baker system. A feature of this station is a park covering five acres directly back of it, in the centre of which is to be placed a fountain, while the grounds will be ornamented with flower beds. The station cost about $20,000.

Train Robbers.

On the New Orleans & Northeastern, near Derby, Miss., on the morning of Nov. 3, about 4 o'clock, a train robber intimidated the baggage master and express messenger of a south-bound passenger train while it was in motion, and robbed the express company's safe of a sum reported as $60,000. After securing the valuables, the robber covered the two men with his pistol while he pulled the bell rope and slackened the speed of the train. Just before the train stopped he gave the signal to go ahead, so that the engineer put on steam just as the robber jumped off and disappeared in the darkness. The train ran some distance before the robbery was discovered by the other trainmen.

Near San Jose, Mex., Oct. 31, three masked men compelled the engineer of a Mexican Central train to cut loose from the passenger cars and pull the express car forward 6 miles, where it was robbed of over $2,000. Reports state, however, that the money in the safe was not secured, the messenger escaping with the keys and taking to the woods. The robbers cut the telegraph wires, and then abandoned the engine.

Railroad Accident in Russia.

On Oct. 29 a special train conveying the Czar of Russia was derailed in Southern Russia, several cars being wrecked. The cause is not given, but it is stated that the Czar picked up a portion of a rotten sleeper, which he will produce at the official inquiry. Twenty-one persons were killed and 37 injured, including the Czar and Czarina, who, however, aided in attending to other persons more severely injured. Dispatches of Nov. 7 state that Admiral Possiet has been dismissed from the Ministry of Railways, owing to this accident. He is succeeded temporarily by M. Vishnegradsky. The same day there was reported a "terrible collision in Southern Russia, near Kovel. Many persons were killed."

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

In this issue will be found a table of new construction for the year up to Oct. 1. The total track laid to the end of the third quarter is 5,043 miles in the United States and 621 in the Dominion of Canada, and in Mexico. In the first half year we reported 2,980 miles in the United States, and 73 in Canada. In the Southern states east of the Mississippi the relative amount of track laid has diminished. In the first half year it was 35 per cent., and at the end of the third quarter it is 28 per cent. of the total. The Southwestern group, including Arkansas, Missouri, Kansas, the Indian Territory and Colorado has also built 28 per cent. of the whole, being a slight increase in ratio over the half year. The greatest increase has been in the Northwestern group, including Iowa and Nebraska, and through to the Pacific. In that territory over 20 per cent. of the new mileage is found at the end of the third quarter, while at the end of the half year the group had built but 11 per cent.

The last opinion rendered by the Iowa Commission in the cases of jobbers of Davenport and Burlington against the Rock Island, the St. Paul and other railroads is interesting not so much for what it contains as for the circumstances under which it was made public. It seems that the Iowa jobbers who were pushing the complaint made a formal demand that the opinion should be rendered *before election*. The Iowa Commission is at present an elective body. The demand under such circumstances was at once a threat and an insult. Yet the Commission complied with it; and only one of three members—Mr. Dey—had the manliness to utter a protest. A more pointed example of the viciousness of the Iowa system could not possibly be given. It is needless to add that the decision is against the railroads. Part of the complaint is dismissed, because it affects inter-state traffic, which is not under the the jurisdiction of the Iowa authorities; but the local rates, over which the Commission has authority, are held to be unjust and extortionate. How far the subject matter of the decision was influenced by the same motives which were made to dictate its time of publication, it is impossible to say.

The clearance of long cars on curves is a subject which is now attracting some attention. Mr. Opdyke's very clear analysis of the factors which govern the extra amount of clearance necessary on curves will undoubtedly prove useful to many. Several instances have occurred recently where the increased length, width and height of the latest sleeping and dining cars have proved inconvenient in passing over lines built in days when the traveling public was contented with cars which would now be considered absurdly small and cramped. Mr. Opdyke's figures, of course, need to be supplemented by some margin for contingencies. It is generally found that at more than one point along a line of railroad the nominal distance from the centre of the track to the edge of a platform or bridge pier has been infringed upon by some mistake in original construction. Such mistakes often remain undiscovered for years, until some new and unusually large locomotive or car strikes the obstacle. Another danger has also to be guarded against. The constant process of leveling and surfacing a line affords an opportunity to depart from the original and correct position of the railheads, and instances have been known where locomotive stacks have been knocked off by overhead bridges where the original section of the line showed several inches clearance. Investigation has generally shown that an increased amount of ballast, thicker ties and deeper rails accounted for the difference, and that the bearing surface of the rails had thus been gradually lifted several inches. Mr. Opdyke's figures appear to show that a 70 ft. car, 9 ft. wide over all, can just run round a 6 degree curve with the ordinary clearance, 6 ft. clear between the rail-heads on a double track and 4 ft. clear from the outer rail to the nearest standing obstruction. As the latest sleeping cars are nearly 70 ft. long and considerably over 9 ft. wide, the clearance on even such a moderate curve as 6 degrees is obviously insufficient on many old roads.

Another point which needs notice is that the distance between centres of trucks often exceeds 70 per cent. of the length over body. This excess exists especially in cars of extra length, as most car-builders place the trucks as near the ends as possible, partly to avoid excessive overhang and partly to minimise the transverse motion of the drawheads when one car is on a tangent and the next car is on a sharp curve. This transverse motion is often so great that cars with the Miller drawbar become uncoupled in passing out of a station yard. Where reverse curves are used with little or no intermediate tangent, this transverse motion is of course increased. Many cars are now running with the distance between trucks 80 per cent. of the length over body, and 75 per cent. is a very usual figure. While placing the trucks as near as possible to the ends decreases the transverse motion of the drawheads, it increases the versed sine on curves, and calls for greater clearance than given in Mr. Opdyke's table. This point should be taken into account by those who are building extra long cars to run over old roads where the amount of clearance at the sides of the track is often limited.

The recent accident at Mud Run raises the question whether it is possible to give the engineer a more unobstructed lookout on locomotives with large fireboxes. Where the engineer stands on the right side of the fire-box, the smoke stack must always more or less obstruct his vision when rounding curves to the left, for he cannot move over to the other side of the engine, as on a locomotive with the ordinary style of cab behind the fire-box. The view may be cleared to some extent by removing the sand-box from the top of the boiler and placing it in the wheel casings, as is now done in many passenger locomotives. The stack, however, still remains to obstruct the line of vision. The use of a plain stack of moderate size somewhat diminishes the difficulty, but even though the headlight might be lowered and placed in front of the smoke-box, the stack is a very essential feature and cannot well be interfered with, though in some French engines the products of combustion were carried from the smoke-box horizontally along the top of the boiler, the chimney or flue finally turning up in the cab and throwing the sparks upwards in the orthodox fashion.*

It is obvious that an engineer, however watchful and careful, cannot safely run a train unless he has at all times a clear and unobstructed view ahead. In anthracite-burning engines, working on lines with sharp curves, a third man has sometimes been placed on the engine as lookout on the left-hand side. But the possible disastrous results of such divided responsibility for the lookout have been shown at Mud Run, and it becomes a question whether a very different solution would not be preferable. The difficulty would be got over if an ordinary cab could be used behind one of these big fire-boxes, and such an experiment seems worth trying, though the difficulties are considerable. It would add somewhat to the total length of the engine, and this would be a serious objection where engines are already fully as long as can be handled on existing turn-tables and in round-houses. Cabs placed above the fire-box are, however, always intolerably hot and the space is so very limited that a change to the ordinary cab would be welcome to the runners. Where two fire doors are used it is of course impossible to provide standing room for the engineer, who would be constantly in the fireman's way, and on such engines the engineer must perforce stand alongside the fire-box. One fire door, however, suffices for the great majority of locomotives, as two are not needed, except with the wide grates which are wholly above the wheels.

* Numerous engines of this class were built for the Northern of France in 1862-63. Illustrations and description are given on pages 89 and 90 of Zerah Colburn's *Locomotive Engineering*. These engines in size and weight equaled our modern Mastodons and Decapods, the grate area being 36 sq. ft. and the total heating surface about 2,500 sq. ft. The weight on the twelve drivers was 132,000 lbs. They appear to have hauled a very moderate train and their performance hardly justified their huge proportions.

The letter which we publish in another column shows the difficulty of giving a clear and correct account of railroad practice in another country, especially when the traveler abroad has but a few brief weeks in which to accustom himself to an astonishing multiplicity of practice, manners and customs which to him are strange. The difficulties of gaining a correct idea of general railroad practice in Europe and especially in England are not lessened by the fact that in points where practice on every road is tolerably uniform here the widest divergence exists on the other side of the water, and that where many methods of attaining the same end are successful here, practice in England is remarkably uniform. Take the matter of fixed visible signals, for instance. Who could generalize and describe in a sentence the enormous variety of signals used on American railroads? Yet on English railroads the uniformity in this respect is remarkable, and the same might be said of switches, the semaphore signal and the split switch being universal. As regards locomotives, the similarity of size, design and type of engines used on passenger service here finds no counterpart in England, where on a single railroad, and standing in the same station, may be found engines with large drivers and small drivers, engines with trucks and engines without trucks, truck wheels 30 in. on tread and truck wheels 48 in. on tread. An inquiring visitor will also find the same superintendent of motive power designing and building at the same time engines for similar service, but in which the essential component parts, boiler, wheels and cylinders, differ not only in themselves but in their relation and connection to one another. The cylinders in one may be horizontal and outside connected, and in the other engine inclined and inside connected. To add to his bewilderment, he would discover that many of the detail parts are interchangeable, and that even in some cases the copper feed pipes were all bent to the same graceful curves and would fit any engine. A visitor might conclude, with some truth, that English engineers had decided that the general arrangement of a locomotive was of little importance provided the details were carefully designed, made of the most suitable material, and put together with the best workmanship. This conclusion would, however, be disturbed when it was observed that a remarkable uniformity obtains in the matter of freight engines, the differences extending only to details, the main arrangement being almost exactly alike, and the weight, tractive power and amount of heating surface showing little variation.

In another column will be found a communication from a distinguished South American engineer, Sr. Don Miguel Tedin, calling attention to the field which is opening in the Argentine Republic for American railroad material. It is stated that out of an equipment of 700 locomotives, 2,000 passenger cars and 15,000 to 20,000 freight cars, but "a small fraction has been built in the United States," but contracts now under way will result in making American rolling stock better known in that country, and would naturally increase the demand for it. Whether or not we can compete in that market with England and Germany must depend somewhat on prices and ocean freights, as well as upon the design and quality of our product; and those elements now depend rather on the general policy of our government than upon the manufacturers. Another element, quite as powerful as that of comparative cost of the material delivered, is the fact that the Argentine roads are largely owned and officered by Englishmen, and that orders for material must in most cases go through a London office. It goes without saying that few of them are likely to get to the United States, even could we fill them at less prices than English manufacturers—which we could not. The existing roads are evidently fully equipped. The amount of equipment per mile of road in the Argentine Republic, as compared with the United States, is shown in the following table. Señor Tedin gives 4,585

miles of track (meaning, doubtless, miles of road) in the Argentine Republic, and we take the freight cars as 17,500. Taking the figures of the last edition of Poor's "Manual" we have:

	Argent. Repub., per mile road.	United States, per mile road.
Locomotives	0.15	0.19
Passenger cars	0.44	0.18
Freight cars	3.71	6.45

It must be remembered that the cars, both freight and passenger, are of the short, English type. Even making that correction the Argentine roads appear to have considerably more passenger equipment per mile than those of the United States, while the freight equipment is very much less. The locomotive equipment is more nearly equal in the two countries. The business done per mile of road was on the Argentine roads, 1,778 passengers carried per mile, and 889 tons of freight. In the United States in the last fiscal year 3,126 passengers and 4,030 tons of freight were carried per mile operated. We have no data of the length of haul, but it is evident that the Argentine roads are sufficiently equipped for the business done. If American capitalists find it desirable to take up some of the concessions and build new lines, a market for American rolling stock will be provided, but even then the rails will be bought in Europe.

An apparently careful correspondent of the *Iron Age*, commenting on disastrous train accidents and their causes, states that passenger trains of 8 and 9 cars are constantly being run between New York and Philadelphia with only one brakeman, notwithstanding the existence of a law of the state of New Jersey prohibiting such practice. He says that when the conductor is in the rear of the train the brakeman is in the forward part. The brakeman in going back to flag on the occasion of unexpected stops relies upon the block signals and moves with deliberation, often returning before he is called in. The same correspondent says that on Western and Southern roads, where very long trips are made, brakeman sleep in sleeping cars. On a prominent Eastern road lately a passenger train arrived at the grade crossing of another road and stopped (at the station); the brakeman attended to the business of the train while the conductor sat in the car reading a paper. The brakeman, by the conductor's direction, moved the train twice, waited for a connecting train, got the passengers aboard and started the train. It is added that this was on a road whose reputation for strict discipline is "unequaled in the country." It is queried whether the heads of departments are not contributory to these and other kinds of negligence by failure to acquaint themselves with the ways of their subordinates. Traveling in special cars is not conducive to the acquirement of information as to what is going on upon regular trains.

All this is interesting, though perhaps not very new, and it is gratifying to note that the public sees things in their right light. It will lead to an intelligent demand for improvement. But there are superintendents who, if we may judge by their practice, would scarcely condemn any of the things here enumerated unless it were, perhaps, placing the single brakeman in the front portion of the train. However short-handed a manager may be willing to run his trains, we never heard of one that approved of omitting the tail end man or of making the conductor act in that capacity. But running with a small force of brakemen has been virtually defended in print by managers of important roads. Brakemen who go out slowly but come back rapidly are common everywhere. Long trips encourage sleeping on duty. Many men allow it on freights who would be horrified at the practice on passenger trains; and yet the danger is nearly or quite as great. Conductors who delegate duties to brakemen are common, especially on branches where visits from high officers are infrequent. But the fact that these loose practices are common does not make them right, and managers are contributors to the negligence, as the writer says; for they might know, if they do not. Riding over the road in special cars, which is now as common with train masters as it was with general managers a few years ago, is certainly no worse than sitting constantly in the office, as many superintendents are almost compelled to do. They must neglect some of their multitudinous duties, and those farthest away naturally are dropped first. Most division superintendents need from two to a dozen $3,000 men as assistants. Managers who think this extravagant might "set up" one or two of their oldest and best conductors as schoolmasters, and try thus to infuse new life into lazy conductors like the one referred to above. Such an educational annex would be valuable in many respects.

Advisory Boards in Europe.

There is nothing which a competent traffic manager or freight agent more strongly desires than facts as to the needs of the business along his line. The shippers on their part are equally desirous of making such facts known. Yet somehow there is a failure to connect at precisely this point. The man who wants the information finds it hard to get it; the man who wishes to give the information finds it equally hard to get a hearing. If any one is listened to it is not infrequently the wrong man, the one who is representing the demands of an exceptional case, rather than the real interests of the majority.

This was noticeably true under the old system of special rates. The shipper who stood in an exceptional position would present his case strongly. If a reduction was made for him, traffic would be gained by the railroad. If the low rate was made general the gain of traffic was not so obvious, and there was for the time being an actual loss in diminished railroad receipts. The system of making rates to develop business had degenerated into a scramble for favors, where abnormal wants were much more heeded than normal ones, and where the special rate was often given to precisely the wrong men.

Now that secret rebates and personal discriminations are so nearly done away with, this evil has been avoided; but present circumstances only throw into stronger relief the lack of direct means of communication between the business of a community and the railroads. Much has been done to prevent the wrong man from being heard, but little has been done toward helping the right man in presenting his demands. In some localities people complain of positive harm from the change. They say that the system of personal favors, bad as it was, mitigated the hardships of a tariff at those points where the evil would otherwise be severely felt; but that now where the schedule of rates bears hard there is no possible means of redress.

Attempts are being made in Europe to secure such direct communication between business men and railroads. Advisory boards, both general and local, have become quite popular in recent years. They have been most strongly developed in Prussia, where the whole matter has been systematized by special legislation which defines the relations of the local and general boards to one another and to the railroad administration. In Austria, Russia, Italy and France there are general boards, but not local ones. The method of appointment varies. In Russia, as might be expected, eleven members of the council are appointed by the Emperor; four by various cabinet ministers, while two representatives of railroad interest are the only ones in whose choice there is anything like independence. In Italy the majority of the committee are also government officials; but seven railroad members and six representatives of agriculture, trade and commerce are elective. In France about half of the committee consists of officials, and the whole body is appointed by the President of the republic. In Austria matters are in better shape, 36 out of 50 members being nominated by various commercial bodies, so that a tolerably independent and active influence is exercised in this way.

In Prussia, the local boards are chosen by the representatives of the various commercial, manufacturing and agricultural bodies in the different districts into which the Prussian railroad system is divided. Each local board deals with those matters which are of especial importance in its district. Those things which affect the general railroad policy of the country are laid before the central board, three-quarters of whose members are chosen by the local boards themselves, and only one-quarter named by the ministry. This system in its general features was adopted some ten years ago, and has, on the whole, given satisfaction. The powers of these boards are purely advisory, but they are of such a nature as to secure the utmost publicity in railroad management and to give the commercial interests the fullest opportunity for a hearing on matters of railroad policy. The government must submit to the central board all proposed radical changes affecting the rates of the country as a whole; and it must generally submit to the same body for discussion any system of exceptional rates and any change affecting the relation of the railroads to the shippers. In order that necessary developments of the latter character may not be unduly delayed, a special committee of the general board is appointed, which has power to give its approval in matters of lesser importance without calling the whole body together.

The most obvious difficulty in trying to apply this method to the United States is due to the absence of any system of trade organizations in our own country which could choose the members of an advisory board. In Prussia, where almost every trade is well organized, it is possible to secure members with a really representative character. Here it might be done in a few large cities, and perhaps in a few leading industries with well-defined trade associations. In the great majority of cases, however, merchants or manufacturers would have to form special organizations as a means of naming their delegates. Such bodies would perhaps be looked upon with distrust. At any rate, the man whose complaint with regard to the existing system was not heard would be sure to claim that he had no chance for having his case properly presented.

Another difficulty, not perhaps so obvious at first sight, but harder to meet in the long run, is the slowness with which any such body could act. This was not so much of a disadvantage in Germany, where trade conditions are more stable, and where the demand for movement in railroad policy is less intense. Yet, even in that country, the advisory boards often tend to delay action. It is hard enough, as every traffic manager knows, for one man to see the different sides of a case. It is the work of months to make twenty or fifty men see them and come to any conclusion about them. The very fact that these bodies are advisory, and that the responsibility rests upon some one else, makes them all the slower about coming to any decision.

On the other hand, this fact has its advantages. Such a board serves as a protection to the railroad management against ill-advised complaint. They are able to do in one way what an intelligent railroad commission does in another. They show the public that reduction in rates is not so simple a thing as is commonly supposed. Where the whole matter is in the hands of the railroad manager who is supposed to be hostile to local interests and is regarded as the representative of a remote body of stock and bond holders, public opinion is readily excited by any delay in meeting its demands. But where representatives of local business interests are admitted to conferences and themselves see how hard it is to come to an agreement which shall meet the immediate demands without doing indirect harm, the public is more readily content to wait. Such a board, even if it accomplishes comparatively little, may serve as a protection against ill-judged legislation. However much its slowness may hamper the railroads, it may also prove a safeguard against agitators who wish to go too fast in a wrong direction. Its functions are in some respects not unlike those of a board of conciliation in preventing disputes between a corporation and its operatives. If we measure its work by the number of points actually settled, it is small; but if we regard it as a means of preventing destructive strife, we see its full importance.

It is more and more clearly recognized that a railroad management has duties to the public as well as to investors. Its duties to investors are under the control of a board of directors, who, if they do their duty, will give publicity to the financial methods of the road. Were the system of advisory boards with regard to rates once fairly established, we might hope to get at the same publicity in the relations between the railroads and shippers which our most far-sighted managers have been glad to secure in their relations to investors. Such result may be far distant, but it is well worth striving for, even under considerable difficulties an discouragement.

American and English Locomotives.

In writing on the vexed question of American versus English locomotives Heli os, whose letter appears in another column, deprecates the dogmatism by which the matter has been obscured, and asks for proofs that an English locomotive could not run on American roads. He is perfectly right in asking for proofs, but the conclusion that English locomotives cannot run on such track as is most common here, with as great average safety and economy as the American locomotives, is the result of a great body of experience. It cannot be confirmed or disproved by a few isolated facts.

The fact that the Pennsylvania has ordered a Webb compound is very interesting, and the experiment seems in a fair way to get all the attention that it deserves. Without doubt the performances of the engine will be carefully watched by liberal minded men in all departments of railroad service, and such lessons as are to be learned from them will not be lost by the ingenious and versatile men who have developed the American locomotive. But the fact that such an order has been placed is no evidence whatever that the "authorities of the Pennsylvania road do not believe that English locomotives are inherently unfit

for American roads." It does indicate, so far as it indicates anything, that these gentlemen believe that they now have tracks on which they can run any engine that can run anywhere in the world—as they undoubtedly have. So far as the relations of the locomotive to the track are concerned, it is safe to predict that it will be found that the Webb will stay on the Pennsylvania rails, at any speed, quite as securely as it keeps the rails of the London & Northwestern, and with as little strain to any of its parts. All of this, however, has no bearing whatever on the old and deeply rooted belief that the English locomotive is not suited to American track. What Mr. Richards had in mind when he spoke, and what American mechanics have had in mind in developing the American locomotive, is not such track and road-bed as are found to-day on the great roads entering New York, but the kind of track common to all American roads until within a few years, and such as many American roads must be contented with for many years to come.

But if Helios' citation of the Pennsylvania proves nothing in the case in point, neither is his flourish about "the frozen roads of Canada, etc.," convincing, for it happens that the American type of locomotive has become universal in Canada, where it superseded the English type, solely because of its greater fitness for the work to be done. Moreover, the American locomotive has for years competed with the English in South America and in Australia, in spite of very unfavorable commercial conditions. And when those commercial conditions send orders to Europe instead of to the United States, the specifications prepared by colonial and South American railroad officials incline decidedly toward the American types We have no doubt that Helios has seen English locomotives working successfully under all of the conditions that he mentions, but we have no doubt that the wear and tear and the cost of repairs would have been less with the American system of equalizers and bogie trucks, and that this is why the American locomotive has so largely taken the place of the English in Canada, Mexico, South America, and Australia.

As track improves there will be modification in locomotive design, and while we see no reason to think that the American system of equalized spring hanging will be given up, it is not impossible that the use of the bogie truck will decrease. In the opinion of pretty high authority this will be so, and there is sense in the question raised by Helios as to six coupled switching engines. Twenty such engines were delivered to the West Shore in its early days, before the track was in its present high condition. These locomotives were put under steam and run to their destination, some as far as Buffalo. The result was considered at the time a pretty good demonstration that these engines could be run at fairly high speeds without any danger of leaving the track. It has become of late years quite a common practice to run passenger engines backwards for convenience in operating. For instance, local trains on the Boston & Albany out of Boston, on the Pennsylvania out of Pittsburgh and on the Illinois Central out of Chicago are worked in this way. In each case the track is kept in high condition, and so far as we know no trouble has arisen from the practice. From these and similar experiences on our own roads, it is argued that the leading truck will be eventually given up for passenger engines running under favorable conditions.

Railroads in British India.

The results of state railroad management in India show a curious mixture of good and evil. The effect on rates and fares has been good; that upon government finance has been bad. In this respect the Indian railroads differ from most other state enterprises where the interest of the taxpayers is apt to be regarded more carefully than that of the general public.

The railroad system of India is a mixed one. Fifty-nine per cent. of the roads are owned by the government, 7 per cent. by native states, and 34 per cent. by private companies. But nearly all the private lines enjoy a government guarantee of interest; while the state lines, on the other hand, have been quite generally built through the agency of private companies, and some are operated in private hands.

The total length of line thus far constructed is something over 14,000 miles. One-third of this has been built since 1880. The capital invested amounts to somewhat less than $900,000,000. The more recent lines have been comparatively cheap, so that the average capitalization per mile is diminishing pretty steadily, and is now only a few thousand dollars greater than in the United States. This greater cost is due partly to the difficulties of location, but chiefly to the low efficiency of native labor, which is able to make use only of ruder appliances, and cannot, at best, work with anything like American or European speed.

Passenger rates are extremely low, hardly averaging two-thirds of a cent per mile. On some of the lines with heavier traffic, charges are decidedly below this average; third class fares in Bengal, for instance, running down as low as $\frac{4}{10}$ of one cent a mile. Under these circumstances the number of passengers carried is large and seems to be pretty steadily increasing. In 1879 it was only 43,000,000, in 1886, 88,000,000, and in 1887, 95,000,000. The average passenger journey was about 44 miles.

Freight traffic is relatively much smaller and freight rates higher. The number of tons carried in 1887 was only 20,000,000. The abstract of returns at hand does not give ton-mileage figures, but simply states that the average receipts per ton-mile were about 1¾ c. This rate, high as it seems to American readers, nevertheless represents a reduction of 25 per cent. since 1881.

But the report of the administration seems to show that this reduction may have been not wisely managed. An article in the *Financial Times* says that the state lines show a loss of 6,500,000 rupees (1 rupee equals not quite 40 c., at present values of silver) on those operated by the government directly, and 4,000,000 rupees more on those leased to private companies, while the receipts from the guaranteed railways have fallen fully 6,000,000 rupees short of the amount necessary to meet the guaranteed interest. On the East Indian Railway there is a little less than 7,000,000 rupees profit to the government, which leaves an aggregate net loss of nearly 10,000,000 rupees, or little short of $4,000,000, in this one year alone. If we go back over the whole history of the roads we find that $170,000,000 has been paid to guaranteed railroads, and nearly $40,000,000 has been expended on state railroads over and above receipts, while a loss of $10,000,000 has been sustained on the leased liens. On the other side, we have only $35,000,000 profit on the East Indian Railway, leaving a grand total deficit of more than $180,000,000. This deficit is exciting serious criticism in England. It seems to be due not to any single cause, but to the combination of a great many. In the first place, the lines were not economically constructed. The method of raising the capital by the mixture of government guarantee and private subscription was not a wise one. Instead of the 4 ft. 8½-in. gauge, some of the roads were constructed with a gauge of 5 ft. 6 in. and some with the metre gauge. In each case this was due rather to personal prejudices of a single individual than to any good financial reason. The early roads were also constructed when silver was relatively high in price, which increased the apparent gold cost of the roads. Now that silver is fallen, the receipts have diminished without any corresponding effect on the capital account.

The reduction of rates has often been made without regard to commercial principles. Those who directed the government railroad policy, feeling that they had the public treasury to draw upon, made all sorts of experiments in lowering rates, thinking that the increase of traffic would prevent evil effects which might otherwise be expected. In this they have been deceived. The gross earnings in 1887, in spite of the increase of mileage, were not as large as they were in 1886, showing a falling off from about $90,000,000 to $89,000,000, while the operating expenses had in the meantime risen from $43,000,000 to $44,000,000. The percentage of operating expenses, it will be noted, is still quite small, and the net earnings would seem to be sufficient to pay most satisfactory interest on the investment, were it not for the unfortunate system of guarantees by which the financial condition of the government is so adversely affected.

Hand-motion Signals.

The figures showing different styles of hand-motion signals for trainmen, shown in another column, illustrate a decided difference in practice which seems to be quite common. Trainmen on many roads—the best-managed as well as others—follow their own inclinations in making day motions, and the practice is diverse in many respects. Not all of this is owing to imperfect or erroneous illustrations in rule-books, for some of the motions may be regarded as outside of and additional to those shown in the books, being for motions which the code does not recognize; but there is need of a change and a reining up if real uniformity is to be attained. The establishment of a set of motions as standard, and its existence on paper only, is as discreditable as was the use of the bad running rules which were a hindrance instead of an aid to the trainmen, and which were discarded on the adoption of the uniform code.

It appears that some conceive that the rule requiring a motion crosswise of the track (see 2 *A*, 2 *B*, 2 *C*) may, in daylight, be complied with in a variety of ways. A man who should be able to read instructions intelligently was seen the other day, in motioning to stop, to move his hand, starting as in 2 *A* or 3 *A*, *on a horizontal line in front of himself*. He was facing the engineer and took the worst possible means of letting him see any *motion* of the hand. It was as unfavorable as would be the motion shown in 2 *A* if the man were *lying flat on his back*. Even where this signal is made with the arm extended sidewise, as in 2 *A*, it would be just as well to hold the arm horizontal and motionless. The day motion to stop is modified in another way. From long familiarity, engineers get in the habit of shutting off steam as soon as they see a brakeman extend his arm horizontally (2 *A*), without waiting for him to drop it; hence, the extension of the arm *without dropping*, or with but a slight downward motion, has come to be, in practice, a signal to stop. Thus far the variation from the rule causes no violent conflict with other rules. But in adopting the uniform code where other motions have been in vogue, a careless construction of the go-ahead rule makes a motion which is in direct conflict with this stop motion, thus neutralizing the attempt at uniformity in the worst possible manner. The rule "Go ahead; a motion up and down" (1 *C*) does not say that the arm must be extended toward the engineer (as in 1 *A* and 1 *B*), and it is consequently construed in the manner farthest possible from the way intended. The men extend their arms horizontally at right angles to the track and hold them nearly or quite stationary in that position, and then move the hands (not the arms) up and down, bending at the wrist. This is very nearly like the stop motion just mentioned, though intended to mean just the opposite. How this misapprehension began we cannot say. Perhaps the dude in fig. 1 *C* is to blame for the attitude he assumes. Whether his unprepossessing appearance results from his having given too much attention to his moustache or from the care necessary to hold his left hand in the graceful position shown in the figure is not clear; but he certainly does not set a good example for day practice. The modest and unassuming person in fig. 1 *B* certainly manifests a better bringing up, and in 1 *A* his appearance of sterling worth and business-like attentiveness is absolutely stunning. He clearly outshines the airy chap.

Signals may be given in the most illogical manner and yet be tolerable, as is the case with bad rules. When a motion to go ahead is given, the train is generally standing, so that uncertainty as to the character of the motion generally does no harm at all, and rarely causes any serious trouble. When a stop motion is given the train is moving, and if it appears doubtful the engineer is aided by circumstances to interpret correctly. With the bell cord the same signal has two indications, one for a moving train and another for one at rest. Similar conditions can be made to partly apply in hand and lamp motions, as just explained; but as long as there is a pretense of having distinctive signals, and it is just as easy to have them as not, they should be enforced. Every one advocates uniform signals theoretically; why should the practice be left to the whims of the men, and to grow less and less systematic?

Some of the old motions, which have been omitted from the uniform code but which still are used by trainmen, have to be made somewhat at variance with the language in which they are (or were) prescribed. As these motions are quite necessary they ought to be recognized in the code. The back-up motion has to be modified to indicate the speed with which it is desired the cars shall be moved. At night this can be done by varying the speed with which the lantern is moved; but in day time the idea can be expressed most clearly by the use of both hands, bringing them together above the head. The go-ahead motion of the uniform code is the poorest in the lot. The motion shown in 1 *A* is very poorly calculated to be seen at a distance, and in point of fact the showing of the hand in the raised position is the substance of the signal. This position corresponds with the perpendicular (all clear) position of a semaphore, and for that reason is correct; but, as with the back-up signal, something more expressive is needed in actual service. The quickness of the motion shown in 1 *B* can be varied the same as 3 *B*, and to the same effect; but in day time the "sweeping parting of the hands" is the most convenient. Trainmen in using this motion, however, do not extend their arms "on a level with their eyes" as the rule specifies. The specification should therefore be changed.

The motion shown in 2 *A* has been criticised by intelligent trainmen as sometimes unavailable, because it has to be made so near the feet. On a crowded passenger platform, for instance, it would be difficult for the engineman to see it. But as long as the placing of the hands above the head is so acceptable as a signal for other motions the critics should at least propose something better for "stop" before condemning this. The great merit of motions 1 and 2 is that they are analogous to the semaphore positions having the same indication; but the advantage of this merit is an empty one if the use of these motions and the entire disuse of conflicting motions is not rigidly enforced. Raising the hands together above the head and spreading them outward, downward and slightly forward is a natural and easy motion to direct the engine to be moved *away from* the person giving the motion; and the bringing of the hands together above the head (or an ordinary beckoning motion somewhat like 3 *A*, the hand being partly in front of the body) is a natural motion to direct the engine to be moved *toward* the person motioning; but they cannot be made uniform with lamp motions. When a man stands in front of an engine and beckons, he means go ahead; when he is behind it he means "back up." The parting-of-hands motion is the reverse of this. They therefore cannot be described as go-ahead or as back-up motions. But they are valuable nevertheless.

The New York Commissioners on the Corning Accident.

The New York Railroad Commissioners have issued a report on the accident of Aug. 12 near Corning, N. Y., on the New York, Lake Erie & Western, a description of which, with diagram of tracks, appeared in the *Railroad Gazette* of Aug. 24. It will be remembered that the east-bound freight had pulled out of the middle track and was wholly upon the south main track when the west-bound express train came along and ran over the misplaced facing point switch leading to the middle track. At the point where the tracks from the two main lines join and run into the middle track there was a stub rail switch; this being set right for the freight was wrong for the express and derailed it, overturning the engine. If this had been a split switch there would probably have been no accident. There was no collision, except that a baggage car struck the engine of a second freight which had just arrived on the south main track. The switch stand of the switch that was misplaced was located between the two main tracks. It is plain that the forward brakeman of the freight misplaced the switch, as it was found set for the middle track; and the other one, which he should have turned, was found to have been forced open by the wheels of the freight train in pulling out upon the main track. The stand was locked and in position for the main track. The brakeman at fault, George H. Keith, has been arrested, and is now under bail awaiting trial. The Board concludes:

First. That facing point switches constituted an element of danger as they always do. Vice-President Felton has informed the Board that they have been done away with as far as possible throughout the length of the road, but that in some cases, as in this, it has been impracticable to abolish them. He also informs the Board that since the accident a distance signal has been erected and interlocked with the signal at the switch, so that ample warning will be given to an approaching train. This will diminish the danger but it does not entirely remove it. If practicable, indeed, if possible, the Board would recommend that trailing switches be constructed instead of the facing point switches, so that west-bound trains desiring to take the centre track will have to back in instead of going in head-on as at present, and the same with regard to east-bound trains.

Second. The Board deems that it is an element of weakness to have the train crew charged with the throwing of these switches instead of a regular switch tender. While it is true that it is the business of the conductor to see that the switches are properly set for incoming and outgoing trains that employé is very likely, and in fact it is probably his practice, to leave the setting of these switches to the trainmen. Responsibility is thus divided. The Board therefore deems that at so important a switch as this a switch tender would greatly promote safety.

Third. It appears that a Wootten engine, which was the pattern of engine hauling train No. 5, is so constructed that the engineer is frequently, indeed generally, alone in the cab, the cab being in the forward part of the engine, and the duties of the fireman requiring him to be in the afterpart thereof. It appears to the Board that this is an undesirable condition of affairs, to say the least. In case of any accident happening to the engineer, either a sudden paralysis, fainting turn, being struck while looking out of the side of the engine, etc., the engine, until the fireman discovered it, would be left without any guidance. Then, too, there are numerous occasions when the engineer has some little offices to perform which distract his attention from the lookout. This should never be allowed; he should call upon the fireman in all such cases. A number of good railroad authorities are of the opinion that the fireman ought to be held jointly responsible with the engineer in keeping a lookout for signals; the Board does not agree to this, as it deems it undesirable to divide the responsibility, which should be thrown, in the opinion of the Board, entirely upon the engineer; but the Board is of the opinion that the conditions ought to be such that the engineer should never be distracted for a moment from the lookout.

All are agreed that it is a sound principle to remove as many facing-point switches as possible, and it is an undoubted fact that there are hundreds of them for whose existence no good reason could be given, and many which the superintendent of the road could hardly give *any* reason for, good or otherwise. But whether, on a road with such a large traffic as the Erie's, heavy freight trains should be made to regularly back into side tracks is not so certain. A freight traffic which justifies a middle siding two miles long (the length of his) certainly is large enough to demand the most perfect appliances, and the ends of such a track may be regarded as of equal importance with the "end of double track" so common all over the country, or with an ordinary junction. Places of this kind are generally provided with an attendant for both day and night, and if so provided, facing-point switches with properly interlocked distant signals and locking bars are perfectly feasible. Before making all freight trains run by the switch and back in—perhaps thereby losing a half hour's time in each instance—the practicability of providing an interlocking plant, with a man in charge, should be fully considered. The Board's view concerning the value of a switch-tender is undoubtedly sound, but the expediency of carrying out that view depends upon the decision arrived at in the other question just alluded to. It will be seen that the possible danger of separating the engineer and fireman too widely and completely appears as a factor in this case the same as at the Mud Run collision. In this connection it is of interest to note that an engine has recently been constructed by a road in Pennsylvania provided with a call-bell and speaking tube for use by the engineer and fireman in communicating with each other. The possible causes of danger mentioned by the Commissioners would hardly be provided for by this device, however, and the fact remains that with these engines the engineer is practically the sole pilot. If an additional lookout man was needed on a train carrying 500 or 600 passengers at Mud Run, why is not the same equally necessary on all trains carrying that number, or even less?

No one denies that there are disadvantages in dividing responsibility; but, on the other hand, the holding of a single individual to a continuous strain such as must be borne by an engineer in a run of an hour or two without a stop, may almost be regarded as a practical impossibility. Certainly, runners actuated by anything but the highest standards of conscientiousness would fall far short of the required standard, and the most conscientious would find great difficulty in living up to their ideals. Unquestionably a large proportion of the firemen now in service are not trained to a sufficiently high standard to properly fill the place of lookout. Some of them are lazy, some ignorant, some careless, some too anxious to please the runner to allow themselves to do anything that would even seem to displease him, and some are afflicted with runners whom to displease would make the fireman's position very uncomfortable. But the Boston & Albany rule, requiring the two men to speak to each other at important signals, certainly deserves a fair trial. Whatever the grade of intelligence of either engineer or firemen, the mere fact of speaking aloud gives definiteness to a transaction which, without such communication, would certainly be more likely to be neglected. An engineer who feels willing to take the entire responsibility upon himself allows it to be assumed that his mental powers are infallible. Some of the old and trusted runners who have caught themselves in serious lapses from duty in this line would probably advise such runners to hold a more modest estimate of themselves. Superintendents can ask themselves, Were I a runner should I feel like resenting or like welcoming the aid of my fireman to guard against a possible lapse? Certainly the high standard insisted upon when an old runner with a good record is discharged for a single failure logically demands that pride of intelligence should not be allowed to enter as a factor in this decision. Some runners would answer this question one way and some the other (if speaking honestly). Which of these classes of runners is the best?

Bills of Lading as Conclusive Evidence.

Among the topics proposed for discussion at the annual meeting of the National Board of Trade in Chicago, Nov. 14, next, is the old one of shippers' rights under bills of lading, the term including, it is understood, the right of the holder of a bill of lading to demand the property, though the bill of lading may have been secured through fraud, and no such property as described therein ever have been received by the carrier. As the matter now stands, a bill of lading, whatever else it may be, is not legal evidence that the property covered by it was ever received by the transportation company, or that the railroad or steamship can be held responsible for it if the goods were never in its possession. Any merchant, therefore, who pays a sight draft with bill of lading attached, supposing that he thus acquires title and ownership of certain cotton, grain, manufactures or other merchandise, runs the risk of not getting any goods or any return of his money, should it happen that the bill of lading was obtained by fraud. The ground of this decision is that the carrier's agent is employed to perform certain specific duties, such as receipting for goods actually received. If goods have not been received, then the receipting for them is beyond the agent's power and consequently void.

Though there is an old decision of the N. Y. Court of Appeals to the contrary (Armour *vs.* Mich. Cen. R. R., in 1875), yet the present law is clearly stated by the Supreme Court of the United States as we have given it. The cases of the fraudulent cotton bills of lading will be recalled by most of our readers. But sometimes the loss occurs in the ordinary course of business without intentional deception Not long ago the treasurer of a Lowell cotton mill paid a sight draft for his purchase of 750 bales of cotton, attached thereto being a bill of lading of the Cairo, Vincennes & Chicago Railroad. It was afterwards learned that this lot of cotton had been destroyed by fire in the compress shed. It appeared that it was the custom of carriers to issue bills of lading upon surrender of the compress company's receipts, although the cotton could not in the ordinary course reach the railroad for weeks. The carrier refused payment.

In view of these commercial losses a bill was introduced in Congress at the last session to make bills of lading conclusive evidence against the carrier when in the hands of innocent holders for value. In the Senate this bill received the attention of able attorneys for the railroads. It was argued that a bill of lading is not a negotiable instrument in the same sense as a promissory note, which in any hands is valid against its maker, but is rather like a warehouse receipt, good only as far as it is genuine; that a railroad must deal with honest and dishonest men alike, but merchants and banks can and do discriminate, relying as much upon the pledger as upon the pledge; that fraud makes every contract void, and railroads are entitled to the benefit of this principle, as well as merchants. Finally, it was said that any number of railroad agents would, under the proposed new law, have power to issue fraudulent receipts to the value of millions—a power greater than the board of directors in issuing a mortgage and one which might bankrupt the company. These arguments killed the bill, and their force must make difficult or impossible the passage of any such law in the future.

If we feel secure in this we may acknowledge frankly and fairly that the innocent holder of a bill of lading often has not the good title to his property which in common justice should be his. We are sure that the railroad should not make good his losses, but if there are any means of preventing them the transporter is bound to consider such. If the National Board of Trade will approach the question in this spirit, the railroad managers will undoubtedly meet them half way. It is the boast of England that her commercia laws are advanced to meet business needs and customs, and the principle is a good one. Every day more and more of our products are moved under a system of bills of lading with drafts attached, which enables money and title to be exchanged with the least inconvenience and delay. The system is simple, and to make it safe may fairly be called a modern necessity. Our own solution would be some sort of countersigning under which a proper officer, under payment of a small fee or without it, could be delegated to declare any bill of lading valid, time enough being allowed to ascertain the facts of actual shipment. This would leave the present system as it is for those who did not care for any guaranty. The so-called factors' acts gave a factor the power to pledge the goods in his possession, such pledge being valid in the hands of an innocent party as against the principal. So in bills of lading; if commerce requires it we can find some way of confirming their value when passed from hand to hand, and where investigation into every detail of their origin could not reasonably be asked.

We made some comment last week on the correspondence between the Iowa Railroad Commissioners and the Rock Island on the subject of the present cash value of the property of that company. We have since received a copy of the correspondence, and although there were some verbal errors in the abstract transmitted in the press dispatches, they were not material. The letter of the Board said: "While it is presumed the 'present cash value' will have to be estimated, the Board would like to know your judgment in regard to it." To this the vice-president of the company replied: "I say, as Mr. E. St. John, the General Manager of this company, said in his letter of the 3d day of December, 1887, in reply to a like inquiry propounded by you for the Board of Railway Commissioners: 'As to the present value of the property mentioned: The information called for consists in opinions based upon facts as accessible to your honorable Board as to any officer of this company. These opinions fluctuate constantly because of crop prospects, the financial condition of the country and the possibility of legislation which may materially affect such value. I am advised that the present cash value of property is measured by the price which it would command if offered at public sale to the highest bidder for cash in hand. What price the railways of this company in Iowa would command at such a sale cannot, in my judgment, be approximately conjectured. If such conjectures were feasible the communication of them to your honorable Board would not answer your questions.'

"That the reasons thus assigned for declining to *guess* at the cash value of this property were duly appreciated by your honorable Board is indicated by your letter to Lusk & Bunn, under date of Nov. 4, 1887. In this you say: 'The Commissioners appreciate the difficulty in answering the question as to the actual cash value of the property, in fact, have never made it one of the questions to be answered until their attention was called to the requirements of the law by the Governor. They have prepared no formal questions for the purpose of making these returns, and, *in fact, have no distinct idea of what was contemplated by the legislative mind when the requirement was made.*'

"The 'difficulties' which you so clearly 'appreciated' less than a year ago have been increased rather than diminished by causes since developed, prominent among which may be noted the legislation of the last General Assembly of the state of Iowa and the attempt of your honorable Board to enforce a schedule of maximum rates which it solemnly admits of record, '*are unreasonable* and entirely too low to enable the common carriers to which the same is to be applied (including the Chicago, Rock Island & Pacific Railway Co.) to transact their business as common carriers without loss;' that it 'knowingly and wilfully made the same too low;' that 'said rates will not enable said common carriers (including the Chicago, Rock Island & Pacific Railway Co.) when the effect thereof shall have been applied to the earnings of said carriers to pay its fixed charges and operating expenses, and the effect of adopting said rates would be to render unproductive the capital invested (by the Chicago, Rock Island & Pacific Railway Co.) in its said railroad property, and to make insolvent many, if not all, of the railroad corporations transacting business in said state of Iowa.'

"Your honorable Board is now asking the Supreme Court of the state to recognize its right to establish such rates and to enforce them though the effect be to drive the railway corporations of the state into insolvency. The admitted character of this schedule, the determination of your honorable Board to enforce it, with confessed knowledge as to the effect of such enforcement, added to other causes, all of which threaten to convert an already accomplished reduction into a destruction of dividends, has created an impression in the public mind, as you must know, that the 'present actual cash values' of railroads in the state of Iowa are lower than they were a few years ago and higher than they will be a few years hence. Any attempt to make a more specific statement would consist in the expression of opinions which would change as the conditions change, and be as indistinct as the 'idea' which your honorable Board has conceived 'of what was contemplated in the legislative mind.'"

There may not be much money for any one in a resolution like the following, which was passed at a meeting of the directors of the Boston & Albany, at Albany, Oct. 11, 1888, but for the older officers there is satisfaction, and for the younger there is incentive. It was resolved: "That the Directors of this company have noted with especial pleasure and satisfaction the admirable and most excellent condition of the entire roadway and the structures along its line, and they take pleasure in expressing to Chief Engineer Russell and his associate helpers their appreciation of the ability and faithful devotion with which they have performed their several duties, and they are pleased to recognize the laudable ambition of these men in all things pertaining to their charge

to make this road superior to any other railroad in the country."

So far as can be gathered from the reports published, the Brotherhood of Locomotive Engineers has taken no decisive action toward federation with other labor organizations, except to agree to the principle that no member of one brotherhood shall take the place of a member of another in case of a strike. This would seem to indicate that the conservative element is still in a majority. The engineers probably have little to lose by a move of this kind, as they are under no great temptation to take the places of brakemen, firemen, etc.

In our report of the last meeting of the Western Railway Club (page 703) we printed a statement made by Mr. G. W. Cushing to the effect that he "had never used bituminous coal." The words "with very wide fire-boxes" were unfortunately omitted.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston, Concord & Montreal, 2½ per cent., on the preferred stock, payable Nov. 1.

Charlotte, Columbia & Augusta, 4 per cent., annual, payable Dec. 5.

Chicago & Alton, 2 per cent., quarterly, upon both preferred and common stock, payable Dec. 1.

Cleveland & Pittsburgh, regular guaranteed quarterly, 1¾ per cent., payable Dec. 1.

Pennsylvania, 2½ per cent., semi-annual, payable Nov. 30.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Arkansas & Gulf, special meeting, Arkansas City, Ark., Dec. 1.

Birmingham Mineral, annual meeting, Birmingham, Ala., Nov. 12.

Brooklyn, Bath & West End, annual meeting, Brooklyn, N. Y., Nov. 8.

Buffalo, Rochester & Pittsburgh, annual meeting, 20 Nassau street, New York, Nov. 19.

Denison & Washita Valley, special meeting, Denison, Tex., Dec. 1.

East Tennessee, Virginia & Georgia, special meeting, Knoxville, Tenn., Dec. 22, to consider the approval of the lease to the Richmond & Danville.

Fort Worth & Denver City, annual meeting, Fort Worth, Tex., Dec. 11.

Georgia Pacific, annual meeting, Birmingham, Ala., Nov. 28.

New York, Lake Erie & Western, annual meeting, 21 Cortlandt street, New York, Nov. 27.

Raleigh & Augusta Air Line, annual meeting, Raleigh, N. C., Nov. 8.

Raleigh & Gaston, annual meeting, Raleigh, N. C., Nov. 8.

Richmond & West Point Terminal Railway & Warehouse Co., annual meeting, Richmond, Va., Dec. 11.

St. Louis Southern, annual meeting, Pinckneyville, Ill., Nov. 21.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Association of Railway Chemists* will hold its next meeting in Baltimore, Md., Jan. 14, 15 and 16.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *Western Railway Club* meets the third Tuesday in each month in the Phenix Building, Chicago.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at Pittsburgh, Pa.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7.30 p. m. on the third Saturday in each month.

The *Arkansas Society of Engineers, Architects and Surveyors* will hold its second annual meeting at Little Rock on Nov. 22, 23 and 24, 1888.

American Society of Civil Engineers.

A regular meeting was held Nov. 7. The special committee on standard time made a report adverse to the recommendation of the standing committee that the Society should urge the study of this subject in common schools, etc. The report was adopted. There was no discussion of the preliminary report of the committee on the Relations of Rails and Wheels, which was one of the topics announced for the meeting. A paper by Mr. Fred. Brooks on Time Reform was read by the Secretary. Ballots for membership were canvassed.

Arbitration Committee, M. C. B. Association.

The Arbitration Committee of the Master Car-Builders' Association to decide on disputed questions arising under the Rules of Interchange is composed of G. W. Rhodes, C., B. & Q.; J. N. Barr, C., M. & St. P.; Robert Miller, M. C.; J. D. McIlwaine, G. T., and F. D. Casanave, Pennsylvania Co. The committee meet at Chicago on the 7th inst.

Engineers' Society of Western Pennsylvania.

The regular meeting of the society will be held at the rooms, Penn Building, Tuesday, Nov. 20, at 8 o'clock p. m. John A. Brashear will give a familiar talk on the subject of "The Status of Astronomical Engineering in Europe." This talk will embody the personal experience of Mr. Brashear in his late trip to Europe.

Master Car-Builders' Association.

The following is the list of subjects, with the committees appointed to report thereon, at the Annual Convention of the Master Car-Builders' Association, to be held June, 1889:

To Formulate a Code of Rules for the Interchange of Passenger Cars, including Sleeping, Parlor, Chair, Baggage and Express Cars. T. A. Bissell, Wagner Palace Car Company, Buffalo, N. Y.; John W. Cloud, New York, Lake Erie & Western, Buffalo, N. Y.; Eugene Chamberlain, New York Central & Hudson River, East Buffalo, N. Y.

Standard Journal-box Lid for a 60,000-pound Car and a Standard Lid for a 40,000 pound Car.—J. W. Marden, Fitchburg R. R., Boston, Mass. Wm. McWood, Grand Trunk, Montreal, Canada. L. Packard, New York Central & Hudson River, West Albany, N. Y.

Standard Brake Gear for Air brake Cars, with a Brake-shoe for Iron Beam.—E. B. Wall, Pittsburgh, Cincinnati & St. Louis, Columbus, O. George Hackney, Atchison, Topeka & Santa Fe, Topeka, Kan. Godfrey W. Rhodes, Chicago, Burlington & Quincy, Aurora, Ill.

Journal Lubrication and Best Practice for Economizing Oil.—John W. Cloud, New York, Lake Erie & Western, Buffalo, N. Y.; H. Roberts, Chicago & Grand Trunk, Detroit, Mich.; J. N. Lauder, Old Colony, Boston, Mass.

Buffers and Carrier Irons for the Master Car-Builders' Type of Coupler and a Standard Length of Draw-bars.—Chas. [illegible]uroyer, Chicago & Northwestern, Chicago, Ill.; E. W. Reeves, Baltimore & Ohio, Baltimore, Md.; E. B. Wall, Pittsburgh, Cincinnati & St. Louis, Columbus, O.

Car Heating and Lighting.—This committee was instructed to select a steam coupler to be submitted to letter ballot for adoption. Frank L. Sheppard, Pennsylvania Railroad, Altoona, Pa.; R. D. Wade, Richmond & Danville, Washington, D. C.; Robert Miller, Michigan Central, Detroit, Mich.

Wheels.—This committee was instructed to ascertain from the members of the Association whether the recommendations of their report would be acceptable to them, and from the replies received and the further experience which they may get during the coming year, to formulate a report, with recommendations, which can be submitted to the next meeting of the Association for letter-ballot, their recommendations to be adopted as a standard, if they meet the approval of the Association. J. N. Barr, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.; John Kirby, Lake Shore & Michigan Southern, Cleveland, O.; George F. Wilson, Minneapolis & St. Louis, Minneapolis, Minn.

Standard Axle for 60,000 lbs. Car.—This committee to report a form and the dimensions for such a standard axle at the next Convention. Godfrey W Rhodes, Chicago, Burlington & Quincy, Aurora, Ill.; John S. Lentz, Lehigh Valley, Packerton, Pa.; R. McKenna, Delaware, Lackawana & Western, Scranton, Pa.

New York Railroad Club.

The next regular meeting of this club will be held at its rooms, 113 Liberty street, New York, on Thursday, Nov. 15, 1888, at 7:30 o'clock.

The topic of the evening will be Freight Train Brakes. A paper will be read by James Howard of the Beals driver brake, on driver brakes in connection with freight train brakes. H. H. Westinghouse of the Westinghouse air brake, and J. H. Slade, of the Eames vacuum brake, will also be present, and take part in the discussion.

Montana Society of Civil Engineers.

A regular meeting was held Oct. 20, Vice-President Beckler in the chair. A committee was appointed to co-operate with committees of other societies on the matter of reform in design and specifications of highway bridges. Col. J. T. Dodge resigned from membership on account of his removal from Montana. The Chair called the attention of the meeting to the dangerous crossing of one of the city streets by the proposed motor line, and suggested the subject as a paper for discussion by the society. A committee was appointed to report on the subject. Mr. E. O. Goodridge, engineer in charge of the north end of the Wickes Tunnel, read a paper on the Ingersoll rock drill, illustrating it with drawings. Mr. Goodridge described the drill in detail, and gave a general description of the work it had accomplished at the Wickes Tunnel. The paper was discussed and referred to the Committee on Topics for report as to the desirability of publishing it. The meeting adjourned to meet Nov. 17.

PERSONAL.

—D. K. Johnson, Superintendent of the Sheffield & Birmingham, has resigned to accept another position.

—H. S. Bryan, Master Mechanic of the Chicago, Burlington & Northern road, has resigned, and has been succeeded by W. H. Lewis, Master Mechanic of the eastern division of the New York, Chicago & St. Louis.

—C. B. Cole, Superintendent of the Cascade & Pacific Division of the Northern Pacific, has resigned, and is succeeded by A. L. Horner, formerly Superintendent of the St. Louis Division of the St. Louis, Iron Mountain & Southern.

—J. Quinlan, General Advertising Agent of the Queen '& Crescent system, has resigned, and the office has been abolished. The duties which formerly devolved on the General Advertising Agent will be transacted in the General Passenger Agent's office.

—W. H. Canniff, Superintendent of the Lansing division of the Lake Shore & MichiganSouthern, has been appointed Assistant General Superintendent a new position created to relieve General Superintendent P. P. Wright. Mr. Canniff has been on this road twenty years, beginning as a station agent.

—Assistant Division Superintendent J. B. Chapin, of the Boston & Albany at Albany, has resigned after a continuous service of 47 years, being the oldest employé in years of service on the road. Mr. Chapin was conductor about 20 years and has been in his present office since 1866. He is succeeded by S. H. Clark, Station Agent at State Line.

—M. J. Carpenter has been appointed General Manager of the Duluth & Iron Range and will have immediate charge of the operating and construction departments. For the last twelve months Mr. Carpenter has been General Agent of this company. Previous to his service with the Duluth & Iron Range he was Superintendent of the Chicago Division of the Minnesota & Northwestern. He has been connected with railroads in various capacities for nearly 20 years.

— H. B. Stone has been appointed Second Vice-President of the Chicago, Burlington & Quincy, and E. P. Ripley, Traffic Manager, will succeed Mr. Stone as General Manager. Mr. Ripley has held the position of Traffic Manager since last June and was General Freight Agent for ten years previous. He has been connected with the traffic department of the Burlington for 18 years. Mr. Stone has spent his entire railroad career on the Burlington, first entering the shops and soon becoming Division Master Mechanic. He was appointed Superintendent of the Locomotive and Car Departments in February, 1880, and has been successively General Superintendent, Assistant General Manager and General Manager.

ELECTIONS AND APPOINTMENTS.

Birmingham, Powderly & Bessemer.—The incorporators of this Alabama company are: I. R. Hochstadter, H. Stolley, E. Lesser and Joseph Beitman.

Central Iowa.—C. H. Ackert has been appointed General Manager.

Chicago, Burlington & Quincy.—H. B. Stone has been appointed Second Vice-President, and E. P. Ripley, General Traffic Manager, has been made General Manager, to succeed Mr. Stone.

Cincinnati, Indianapolis, St. Louis & Chicago.—The annual meeting held recently resulted in the re-election of the old directors. They are M. E. Ingalls, George Hoadly, Samuel J. Broadwell, Alexander McDonald, L. Anderson, Orlando Smith, Thomas A. Morris, Allen M. Fletcher, R. R. Cable, E. T. Jeffrey, George Bliss, C. P. Huntington and J. Pierpont Morgan. The election of officers was deferred.

Cincinnati, New Orleans & Texas Pacific.—J. C. McCarty has been appointed Master Mechanic of the New Orleans & Northeastern and Vicksburg & Meridian roads, with headquarters at Meridian, Miss., vice J. N. Fowle, resigned.

Denver & Rio Grande.—John J. Burns has been appointed Superintendent of Transportation, with headquarters at Denver, Col. W. A. Deuell has been appointed Division Superintendent, with office at Denver.

Indianapolis & St. Louis.—R. Neal has been appointed Chief Train Dispatcher, with office at Indianapolis, to succeed A. M. Mozier, resigned.

Kansas City, Wyandotte & Northwestern.—Francis Mathews has been appointed Chief Engineer.

Lake Shore & Michigan Southern.—W. H. Caniff has been appointed Assistant General Superintendent, with office at Cleveland, O. T. F. Whittelsey has been appointed Superintendent of the Lansing Division, with office at Hillsdale, Mich., vice W. H. Caniff, promoted. T. W. Niles has been appointed Superintendent of the Kalamazoo Division, with office at Kalamazoo, Mich., vice T. F. Whittelsey, transferred.

Missouri, Kansas & Texas.—The receivers announce the following appointments: J. J. Frey, General Superintendent; A. S. Dodge, General Freight Agent; Gaston Meslier, General Passenger and Ticket Agent; G. J. Pollock, Auditor; B. P. McDonald, Treasurer; Geo. H. Hyde, Paymaster; J. D. Hollister, General Claim Agent. The office of all will be at Sedalia, Mo. The following officers of the transportation, mechanical and car departments are announced: Wm. O'Herin, Master Mechanic, Parsons, Kan.; C. P. McElvainy, Master Mechanic, Denison, Tex.; Robert Walker, Master Car-Builder, Sedalia, Mo.; P. Rockwell, General Roadmaster north of Denison, Parsons, Kan.; M. A. Martin, Superintendent of Bridges and Buildings, Parsons, Kan., and C. H. Dent, Superintendent of Car Service; Howard W. Beecroft, Car Accountant; Edward N. Small, Chief Surgeon; Samuel K. Bullard, Superintendent Telegraph; I. A. Taylor, fuel, tie and lumber agent, all with office at Sedalia. General Freight Agent Dodge has made the following appointments: J. W. Allen, Assistant General Freight Agent, Sedalia; G. H. Turner, Division Freight Agent, Dallas.

Missouri Pacific.—B. D. Caldwell has been appointed Assistant General Passenger Agent to succeed G. Weslier, resigned.

New York, Pennsylvania & Ohio.—J. C. Moorhead has been appointed Superintendent of Transportation, with office at Cleveland, O. Mr. Moorhead will have charge of the car service, his position being the same as that to which Mr. Barrett has recently been appointed on the Erie proper. A. M. Mozier has been appointed Superintendent of the Western Division, with the office at Galion, O., vice J. C. Moorhead, promoted.

Northern Pacific.—N. C. Thrall has been appointed Assistant to President Oakes, with office at St. Paul.

Orange Belt.—J. F. Sheahan has been appointed Master Mechanic, with office at Oakland, Fla.

Penobscot & Aroostook.—Organized at Great Works, Me., by the choice of W. T. Pearson, of Bangor; J. B. Mullen, C. W. Mullen, C. H. Montague, of Old Town; S. L. Montague, of Cambridge, Mass.; E. H. Clapp, of Boston, and H. J. Gilbert, of Milton, Mass., as directors. The capital stock was placed at $50,000. The directors organized by the choice of E. H. Clapp as President, S. L. Montague as Treasurer, and C. W. Mullen as Secretary.

Philadelphia & Reading.—W. C. Brister has been appointed Chief Special Officer.

Richmond & Danville.—W. A. Walden has been appointed Master Mechanic of the Atlanta & Charlotte Division with headquarters at Atlanta, Ga., vice Mr. A. W. Gibbs, transferred. Mr. S. J. Neisler has been appointed foreman at Charlotte, vice Mr. W. A. Walden, transferred.

Richmond & Danville.—C. A. Gibbs, Master Mechanic of the shops at Atlanta, Ga., has been transferred to the Alexandria, Va., shops. W. A. Walden will succeed him at Atlanta.

St. Joseph & Grand Island.—E. H. Dewson, Jr., has been appointed Master Mechanic, with office at St. Joseph, Mo.

St. Louis, Keokuk & Northwestern.—The following appointments are announced: J. H. Palmer, General Agent, and C. E. Osborn, Traveling Passenger Agent, with headquarters at Atlanta, Ga.; George H. Branston, Traveling Passenger Agent, and E. J. McDale, City Passenger Agent, with headquarters at St. Louis.

San Diego, Old Town & Pacific Beach.—The incorporators of this California road are: A. G. Gassen, R. A. Thomas, E. W. Morse, T. E. Metcalf, J. R. Thomas, of San Diego.

Santa Ana & Long Beach.—The incorporators of this new California company are: J. G. Burt, R. F. Cunningham, M. MacDonald, Joel Lightner, C. F. Roe, William A. Harris and M. A. Murphy.

Seattle, Lake Shore & Eastern.—At the annual meeting in Seattle the following Board of Directors was elected: James D. Smith, M. S. Paton, J. F. Alexander, T. M. Logan, G. W. Butts, Jr., D. H. Gilman, J. R. McDonald

F. H. Osgood, L. C. Gilman, T. T. Minor, G. G. Lyon and W. R. Tharnell.

Texas & Pacific.—E. W. Tower has been appointed Assistant to the Auditor, with office in Dallas, Tex.

Union Pacific.—The following circular has been issued by President C. F. Adams: At a meeting of the Board of Directors held in Boston, Oct. 24, Mr. William H. Holcomb was elected a member of the Board, and subsequently Vice-President of the company. The office of Vice-President Holcomb will be at Omaha, and he will be recognized and obeyed as Chief Executive officer of the Union Pacific system at the West. Acting General Manager Thomas L. Kimball is appointed General Manager, appointment to take effect from Nov. 1. Purchasing Agent C. S. Mellen is appointed Assistant General Manager, appointment to take effect from Nov. 1. The duties of Purchasing Agent and Assistant General Manager are consolidated, and Mr. Mellen will perform the duties of both offices, under the title of Assistant General Manager and Purchasing Agent. The appointments heretofore made of Edward Dickinson as General Superintendent, J. A. Monroe as General Freight Agent, and J. S. Tebbets as General Passenger Agent, are confirmed, and the individuals named will continue to perform the duties of their several offices.

Union Transfer.—The incorporators and first board of directors of this Illinois company are: Andrew Crawford, of Lake View, Ill.; Arthur H. Sullivan, of South Evanston; James A. Reeve, Thomas H. Trumbull and Park E. Simmons, of Chicago.

Vincennes & New Albany.—The names and addresses of this company are as follows: Edward Watson, President; N. F. Dalton, Secretary; E. Woltmann, Treasurer. The general office is at Vincennes, Ind.

OLD AND NEW ROADS.

New Companies Organized.—Birmingham, Powderly & Bessemer.—Coudersport, Hornellsville & Lackawanna.—McKeesport & Bessemer.—San Diego, Old Town & Pacific Beach.—Santa Ana & Long Beach.

Birmingham Mineral.—The stockholders of the company will meet in Birmingham next week to vote upon a proposition to increase the capital stock $3,000,000. This increased capitalization is to be used in extending the road and adding to its equipment.

The Self Creek branch, four miles in length, has been completed, and was turned over to the operating department this week.

Birmingham, Powderly & Bessemer.—Incorporated in Birmingham to build a road from Birmingham to Bessemer, via Elyton, West End, Cleveland and Powderly. The capital stock is $100,000. The survey is to be made immediately.

Canadian Pacific.—It is stated that the company will build a branch line from Nelson, the end of the navigation on Kootenai Lake, Idaho, to the Columbia River, tapping the mineral belt of the Kootenai district. It is also reported that a line of steamers will be equipped on the Columbia River to connect with the main line of the Canadian Pacific at Revelstoke, B. C., a distance by river of 130 miles.

Chicago & Eastern Illinois.—This road has bought of the Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific, joint owners, extensive freight buildings and terminal grounds in Chicago, north of Fourteenth street, for about $1,500,000. The price was left to referees. It is said that a bonus of $300,000 has been offered by other parties for the right to assume the purchase.

Chicago, St. Louis & Paducah.—The first train over the completed road was run Nov. 2, from St. Louis to Brooklyn, Ill., opposite Paducah, Ky. The road is leased to the St. Louis & Cairo Short Line, and connects with that road at Marion, Ill., and is about 55 miles long.

Coudersport, Hornellsville & Lackawanna.—Chartered in Pennsylvania with a capital stock of $220,000 to build a road 22 miles long, from Coudersport, Potter County, to the New York state line. The Treasurer is Henry J. Olmstead, and the principal office will be at Coudersport.

Denison & Washita Valley.—A meeting of the stockholders will be held in Denison, Tex., Dec. 1, to vote on a proposition to increase the amount of the bond issue from $16,000 to $20,000 a mile. The road, as proposed, will extend from Denison to Coalfields, near Lehigh, Indiana Ter.

Dexter & Piscataquis.—The certificate has been signed incorporating the new Maine company. The capital stock is $110,000, of which five per cent. has been paid in.

East Tennessee, Virginia & Georgia.—Holders of the junior securities of the East Tennessee, Virginia & Georgia, the Richmond & Danville and the Richmond & West Point Terminal have filed a petition at Knoxville, Tenn., praying for a writ of injunction and the appointment of a receiver for the company. The plaintiff prays that the lease of the road to the Richmond & Danville be declared void, on the grounds that it was made in violation of law and against public policy.

Evansville & Terre Haute.—President D. J. Mackey, of the Evansville & Terre Haute, has issued a circular giving details of the construction of the road, which is being built by the Evansville & Terre Haute. The line extends 150 miles from Elnora on the line of the Evansville & Indianapolis to Richmond, Ind., and passes through the best coal territory in Indiana, as well as building stone quarries and timber districts. The company has a subsidy of $200,000 and expects an additional $100,000 under the state law. The cost of the road will not exceed $9,000 a mile. The road will connect at Greensburg with Cincinnati, Indianapolis, St. Louis & Chicago, and make a shorter route to Cincinnati. Work is progressing rapidly.

Georgia Pacific.—At the annual meeting to be held in Birmingham, Ala., Nov. 28, the proposition for a lease of the road to the Richmond & Danville will be submitted for action. The Georgia Pacific was built by the Richmond & Danville Extension Co., which is controlled by the Richmond & West Point Terminal. The road extends from Atlanta, Ga., to Columbus, Miss., 291 miles, and from Greenville, Miss., to Johnsonville, Miss., 30 miles, the latter division being narrow gauge. The 142 miles between Columbus and Johnsonville is under construction. The company has at present a traffic contract with the Richmond & Danville by which that company lays aside 20 per cent. of the gross business earnings received from an interchange of business with the Georgia Pacific as a guarantee fund for the payment of any deficiency in first-mortgage bond interest.

Gloucester & Atco.—Chief Engineer George A. Morris states that the preliminary lines for the road have been run, the levels taken, and everything will be ready for the reception of bids for its construction in about two weeks.

Jacksonville, Tampa & Key West.—The negotiations by which the company secures a controlling share of the stock of the Florida Southern have been finally consummated. The negotiations have been under consideration by the companies since last August. The St. John's road, 15 miles long, and the St. Augustine & Palatka, 25 miles long, have also passed into control of the company. The Florida Southern is 308 miles long, the main line extending south from Palatka to Punta Gorda on the east coast of Florida, 237 miles. The Jacksonville, Tampa & Key West has 203 miles of road, the main line extending from Jacksonville to Sandford, Fla., 127 miles. These purchases give the road control of a system of 651 miles, the largest in Florida. The company also operates river steamboat lines of 325 miles. The Florida Southern is a Boston road, the directors being all Massachusetts men. The Florida Southern and the Jacksonville, Tampa & Key West connect at Palatka and Sanford. The capital stock of the Florida Southern is $2,595,400, and there are now outstanding $2,118,900 of first mortgage six per cent. bonds. Upon the Charlotte Harbor division $800,200 of first mortgage 6 per cent. bonds have been issued, and upon the St. Johns & Eustis there have been issued $89,500 of capital stock and $285,500 of bonds. The bonds and stock of the company are to be given in trust to the American Loan & Trust Co. of Boston, and the Jacksonville, Tampa & Key West will make an issue of collateral trust bonds secured by the securities so deposited. The Florida Southern, it is understood, will take the new collateral trusts loan in exchange for their securities, which makes the Jacksonville, Tampa & Key West practically the lessee of the Florida Southern, guaranteeing the interest on its bonds upon a sliding scale. For two years the new collateral trust loan will bear 3 per cent interest, for three years thereafter 4 per cent., and for five years thereafter 4½ per cent.

Knoxville & Ohio.—The stockholders of this company, and the East Tennessee, Virginia & Georgia, have ratified the lease of the road to the latter company. The Knoxville & Ohio extends from Knoxville to Jellico, Tenn., 66 miles.

Lake Shore & Michigan Southern.—The company has made a contract by which, commencing Nov. 1, the road has running rights over the New York, Lake Erie & Western on the Sharon Branch of the New York, Pennsylvania & Ohio from Sharon, Pa., to Sharpsville and also from the Middlesex extension to West Middlesex. There are many rolling mills and iron furnaces in this region, and the traffic is heavy. For years this company has been trying to enter this region, but the attempt was met with numerous and serious obstacles. The Erie resisted the project at every step and entered numerous suits. After great difficulty the Lake Shore succeeded in building from Doughton, O., to Sharon, Pa., a distance of about 7 miles, and opened the branch last December. Work has since been done on a farther extension to Sharpsville, but in view of the obstacles interposed it was very slow. Recently negotiations for a settlement of the trouble were entered into between President Newell and Vice-President Thomas, and the result is the abandonment of the projected Sharpsville extension and the right to use the branch.

Leamington & St. Clair.—This road has been opened for business from Leamington, Ont., northward to Comber, a distance of 15 miles.

McKeesport & Bessemer.—Incorporated in Pennsylvania to build a road from McKeesport, in Allegheny County, to a point below the Port Perry Bridge, opposite Bessemer, in Mifflin Township, Allegheny County. The capital stock is $49,000, and the road will be about four miles long and will be a branch of the Pennsylvania, and give that road an entrance to McKeesport. A bridge will be built across the Youghiogheny River, connecting the new line with the McKeesport & Belle Vernon Road, now under construction.

Memphis, Little Rock & Indian Territory.—Active construction work on this road was commenced last week by a large force of laborers under Chief Engineer Schwaucke, at a point in Hutchison Gap, about 10 miles from Little Rock. It is expected to have the 10 miles to Little Rock completed in a few weeks.

Missouri, Kansas & Texas.—The receivers, in taking control of the property Nov. 1, issued a circular stating that: By virtue of an order made by the Hon. David J. Brewer, Judge of the Circuit Court of the United States for the District of Kansas, wherein the Mercantile Trust Company, trustee, was complainant, and the Missouri, Kansas & Texas and the Missouri Pacific are defendants, receivers were appointed, and instructed to take charge of and operate the property of the road from Nov. 1. The lines embraced in this order are described as follows: Hannibal to Denison, 575 miles; Parsons to Junction City, 157 miles; Denison to Mineola, 103 miles; Greenville to Dallas, 52 miles; Dallas to Gainesville, 40 miles; Gainesville to Henrietta, 71 miles; Denison to Dallas, 39 miles; Jefferson to Greenville, 124 miles; Greenville to McKinney, 31 miles; the joint operation of the track between Whitesboro and Fort Worth under the joint lease with the Texas & Pacific, 71 miles; Forth Worth to Taylor, 162½ miles; Taylor to Boggy Tank, 89 miles; San Marcos to Lockhart, 15 miles, and the Trinity & Sabine Division from Trinity to Colmesneil, 67 miles and 15 miles of other branches; total, 1,612 miles, and the incomplete lines of the Dallas & Waco and Taylor, Bastrop & Houston roads now under construction in Texas. That portion of the Missouri, Kansas & Texas between Holden & Paola, 54 miles, now under lease to the Missouri Pacific, will continue to be operated by that company, until further notice. The general offices of the Receivers will be at Sedelia, Mo.

Judge Brewer in the U. S. Circuit Court of the Eastern District of Kansas has decided in the Allen County case, in which certain alternate sections of land granted by the government to the company were claimed by the settlers thereon, that the land in question legally belongs to the railroad company. The settlers will, therefore, be compelled to give possession. The tract embraces a large amount of the most fertile farming lands in the country.

Missouri Pacific.—The extension from Talmage to Crete, in Saline County, Mo., 58 miles, was opened for traffic Nov. 1.

Mobile, Jackson & Kansas City.—The company has bought the right of way and roadbed of the Mobile & Northwestern road, which extends some 20 miles in a northwestern direction from Mobile, Ala. The roadbed is in fair condition, and will cost but little to put in good order.

New York & Connecticut.—It is announced that a majority of the capital stock has been transferred from the original holders. The new company has organized with a capital stock of $1,500,000, and has elected a new board of directors and W. H. Stevenson President.

Norfolk & Western.—The Clinch Valley extension is now in operation to Tazewell, Va., 19 miles from Graham Va.

Omaha, Dodge City & Southern.—The company has filed amended articles of incorporation in Kansas increasing the capital stock from $7,000,000 to $12,000,000.

Oregon Railway & Navigation Co.—All difficulties with the Cœur d'Alene Indians about the right of way through the reservation in Idaho have been settled and right of way granted. Two thousand men will immediately be put to work to complete the road, and the line will reach Spokane Falls by early spring. The road is being built by the Washington & Idaho, and has been completed from Farmington, Wash. Ter., to the reservation, and is under construction to Mullan, Idaho, 90 miles. The distance to be built across the reservation is about 53 miles, through a somewhat hilly country, where there will be considerable heavy work. The contract was let some time since to Kilpatrick Bros. & Collins, of Beatrice, Neb.

Pittsburgh & Lake Erie.—Last week the appealed case of James A. Bennett and others against Cornelius Vanderbilt, in the Supreme Court of Pennsylvania, was discontinued on application of the appellants. This gives the defendants a clear title to their control of the Pittsburgh & Lake Erie road, and the agreement which was made to perpetuate the independence of the road is broken. By the trust the voting power of a majority of the stock was vested forever in a board of five trustees and their successors, whose duties were defined by the trust agreement. The Vanderbilts, however, purchased a controlling interest in the stock, and at the annual meeting in January, 1887, Cornelius Vanderbilt attempted to vote this stock in the selection of a board of directors. He was ruled out, however, and the trustees were given the selection of the board in accordance with the terms of the trust. Mr. Vanderbilt carried his case to the courts and won it. He will hereafter vote the stock and elect directors of his own selection without the intervention of any trustees.

Pittsburgh, Shenango & Lake Erie.—The construction of the extension from Amasa, Pa., to Conneaut, O., on Lake Erie, which was suspended recently, has been resumed, and the work will soon be completed. About 40 miles is now graded and ties laid on 25 miles. It is expected to have the remaining 10 miles graded and the rails laid on the whole line by next spring. The road connects at Amasa with the Lake Shore & Michigan Southern. Extensive improvements to the dock facilities at Conneaut are being made.

Raleigh & Augusta.—The extension from Cameron, N. C., to Carthage, a distance of 10 miles, is now open for passenger and freight traffic.

St. Catherines & Niagara Central.—The road will be opened in a few days from St. Catherines, Ont., to Niagara Falls, 12 miles. The road gains an entrance to Buffalo over the Niagara branch of the Michigan Central. It is expected to continue the road from St. Catherines to Toronto, a distance of 68 miles, and the survey has already been made.

St. Joseph & Grand Island.—The road commenced on Nov. 1 to operate 52 miles of road between Stromberg and Valparaiso, Neb. This was formerly a branch of the Union Pacific, known as the Omaha & Republican Valley road.

San Diego, Old Town & Pacific Beach.—Additional articles of incorporation have been filed in California. The road will run from Arctic street, San Diego, to a point on the Pacific Ocean, ten miles distant, in the direction of Old Town. The capital stock is $250,000, of which $80,000 is subscribed.

Santa Ana & Long Beach.—Articles of incorporation have been filed in California to build a standard gauge road from Santa Ana to Long Beach, a distance of about 20 miles. The survey for the line will soon be commenced. The capital stock is $2,500,000.

Selma & Atlantic.—Surveys will, it is said, soon be commenced for this road, which is projected to extend from Carrolton, Ga., to Selma, Ala.

Texas & Pacific.—Judge Pardee, of the United States Circuit Court, at New Orleans, has issued an order discharging Gov. John C. Brown from the receivership.

Union Transfer Co.—Articles of incorporation have been filed in Illinois, with principal offices at Chicago, and a capital stock of $2,000,000, to construct a system of transfer tracks on routes so laid out as to connect nearly all the great lines centring in Chicago without carrying the traffic directly through the city.

Vincennes & New Albany.—The surveys have been completed for this road, which it is proposed to build from Vincennes to New Albany, Ind., and thence to Louisville, over the Kentucky & Indiana bridge. About half of the right of way and $230,000 in donations have been secured. The contract for building the road has been let to S. R. Bullock & Co., of New York.

TRAFFIC AND EARNINGS.

Traffic Notes.

Sixteen car loads of hops were taken east from Seattle, Wash. Ter., in one shipment last week.

Ticket agents of the Erie have received notice that the order of April, 1887, forbidding them to receive ticket commissions from other roads is rescinded.

Freight rates from eastern points to El Paso, Tex., are so much higher, proportionately, than through rates to Mexican points that merchants in El Paso have been in the habit of ordering their goods shipped to Mexico and then getting them out of the custom house by legal process before they crossed the line. The Texas roads have given orders to refuse to deliver goods in cases of this kind.

The Buffalo correspondent of the *Coal Trade Journal* says that there is practically a famine of soft coal at that point, caused by the scarcity of cars. All the railroads are very short of fuel, and it is stated that the New York Central has confiscated coal shipped over its line for Canadian dealers in order to supply its engines. The coal dealers say that the railroads make no provision for the natural increase of the coal trade, keeping two years behind the demand for cars.

Free Delivery of Freight.

The Central of Georgia has announced, at Birmingham, Ala., that all shipments from northern and eastern points will be delivered by wagon free in that city after Nov. 1. The regular truckmen charged higher for delivering from this company's station than from those of other roads, on account of the long distance. It is reported that the Georgia Pacific and Alabama Great Southern have issued a circular announcing similar action.

Iowa Freight Rates.

The Iowa Railroad Commissioners have rendered a decision in the cases brought by the jobbers of Davenport, Dubuque and Burlington, charging certain railroads with conspiracy to maintain extortionate rates and to discriminate against Iowa cities. The Board finds that conspiracy is not proved and that the discriminations are inter-state, and so beyond its control. It is stated, however, that unjust and extortionate rates do exist; local rates from Iowa jobbing centres to the smaller towns in their vicinity being so high that, even with

low rates from Chicago to the jobbing centres, the Iowa wholesale dealers are still unable to compete with Chicago firms which ship direct to the small towns at low rates. The Board says that in many instances the discriminations in favor of Chicago are 20 and 25 per cent. The commissioners are of the opinion that a reduction of local rates is the proper remedy for the protection of Iowa interests. Commissioner Dey declines to join in the decision, saying:

"Mr. Fred Wild, of Davenport, Secretary of the Twin Cities Freight Association, in a letter dated Oct. 31, has threatened me in the name of the jobbers of the state with their opposition to my candidacy for Railroad Commissioner unless the opinion of this Board in the Davenport case was made public on or before Friday, Nov. 2. In this situation I am compelled by my feelings of self-respect to decline until after the election to give any expression of my views upon the subject. I do not believe that a public officer whose duty it is to determine questions of this kind, which are practically judicial, should allow personal interests to sway his judgment."

Trunk Line Rates.

The Pennsylvania, on Nov. 7, reduced provision rates from Chicago to the seaboard five cents, making them 30 cents L.C.L., and 25 cents C.L.

Demurrage at St. Paul.

The roads entering St. Paul and Minneapolis are perfecting an organization apparently similar to that in Chicago, for enforcing the collection of pay for the detention of freight cars. The rates given in the newspaper accounts are: First 48 hours free; next five days $1 per day; next five days $2 per day.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Nov. 3, amounted to 54,924 tons, against 56,088 tons during the preceding week, a decrease of 1,164 tons, and against 49,026 tons during the corresponding week of 1887, an increase of 5,898 tons. This includes flour, grain, seeds, provisions, dressed beef, hides, wool and lumber. The proportions were:

	W'k to Oct. 27.		W'k to Nov. 3.	
	Tons.	P. c.	Tons.	P. c.
Wabash	4,834	8.6	3,752	6.8
Michigan Central	5,615	10.0	6,880	12.5
Lake Shore & Mich. So.	8,393	15.0	7,964	14.5
Pittsburgh, Ft. W. & Chicago	7,866	14.0	7,521	13.7
Chicago, St. L. & Pittsburgh	9,060	16.2	8,941	16.3
Baltimore & Ohio	2,015	3.6	1,728	3.1
Chicago & Grand Trunk	7,926	14.1	7,911	14.4
N. Y., Chicago & St. Louis	4,319	7.7	4,696	8.6
Chicago & Atlantic	6,066	10.8	5,531	10.1
Total	56,088	100.0	54,924	100.0

Of the above hipments 2,850 tons were flour, 21,902 tons grain, 3,018 tons cured meats, 2,055 tons lard, 7,820 tons dressed meats, 913 tons butter, 1,111 tons hides, 475 tons wool, and 3,732 tons lumber.

The two Pennsylvania lines together carried 30.0 per cent., while the three Vanderbilt lines together carried 35.6 per cent.

Cotton.

The cotton movement for the week ending Nov. 2 is reported as follows, in bales:

Interior markets:	1888.	1887.	Decrease.	P. c.
Receipts	176,015	208,875	32,860	15.7
Shipments	152,493	175,667	23,174	13.4
Stock	221,902	301,961	80,059	26.5
Seaports:				
Receipts	279,536	289,174	9,538	3.3
Exports	188,830	213,226	24,396	11.4
Stock	617,470	684,477	67,007	9.8

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending Oct. 27, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending Oct. 27	224,558	91,104	315,662
Total for year 1888 to date	9,546,470	3,269,884	12,816,354
Total for year 1887 to date	8,426,829	2,952,410	11,379,239

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

	1888.	1887.	Inc.
Total for week, Oct. 27	44,212	29,173	15,039
Total for year	1,366,391	1,298,515	67,876

Railroad Earnings.

The reports of earnings and expenses of the various railroad companies for the month of September and the nine months to Sept. 30 are as follows:

ATCHISON, TOPEKA & SANTA FE.

Month of September:	1888.	1887.	Inc. or Dec.
Miles of road operated	3,024	2,702	I. 322
Gross earnings	$1,411,850	$1,506,261	D. $94,411
Operating expenses (less taxes)	920,695	835,029	I. 85,666
Net earnings	$491,155	$691,232	D. $180,077
Nine Months—Jan. 1 to Sept. 30:			
Miles of road operated	3,019	2,522	I. 497
Gross earnings	$11,238,992	$13,634,174	D. 2,395,182
Operating expenses (less taxes)	7,830,778	7,401,800	I. 428,978
Net earnings	$3,408,214	$6,232,374	D. $2,824,160

PENNSYLVANIA (EASTERN LINES).

September:	1888.	1887.	Inc. or Dec.
Gross earnings	$5,285,426	$5,006,568	I. $278,858
Operating expenses	3,329,982	3,248,373	I. 81,609
Net earnings	$1,955,444	$1,758,195	I. $197,249
Jan. 1 to Sept. 30:			
Gross earnings	$43,356,976	$41,053,674	I. $2,303,302
Operating expenses	28,960,941	26,930,019	I. 2,030,922
Net earnings	$14,396,035	$14,123,655	I. $272,380
West. lines—def	20,481	sur. 731,943	D. 752,424
Total net	$14,375,554	$14,855,594	D. $480,044

UNION PACIFIC.

September:	1888.	1887.	Inc. or Dec.
Gross earnings	$2,667,905	$2,743,979	D. $76,074
Operating expenses	1,617,752	1,365,832	I. 251,920
Net earnings	$1,050,150	$1,378,147	D. $327,994
Jan. 1 to Sept. 30:			
Gross earnings	$21,292,905	$20,781,963	I. $511,062
Operating expenses	13,170,913	12,337,713	I. 833,199
Net earnings	$8,121,993	$8,444,250	D. $322,257

CANADIAN PACIFIC.

September:	1888.	1887.	Inc. or Dec.
Gross earnings	$1,130,947	$1,163,206	I. $67,741
Operating expenses	772,295	685,240	I. 87,095
Net earnings	$358,652	$377,966	D. $19,317
Nine Months—Jan. 1 to Sept. 30:			
Gross earnings	$9,371,428	$7,904,468	I. $1,466,960
Operating expenses	7,078,552	5,807,567	I. 1,270,985
Net earnings	$2,292,876	$2,096,901	I. $195,975

The earnings and expenses of the Southeastern and International roads not included.

CHICAGO, BURLINGTON & QUINCY.

The report for September and the nine months to Sept. 30 is as below:

Month of September:	1888.	1887.	Inc. or Dec.
Gross earnings	$2,475,144	$2,464,924	I. $10,220
Operating expenses	1,486,696	1,331,627	I. 155,069
Net earnings	$988,448	$1,133,319	D. $144,869
Nine Months—Jan. 1 to Sept. 30:			
Gross earnings	$16,588,812	$20,290,933	D. $3,702,621
Operating expenses	13,271,238	11,234,759	I. 2,036,479
Net earnings	$3,317,074	$9,056,174	D. $5,739,100

NORFOLK & WESTERN.

September:	1888.	1887.	Inc. or Dec.	P.c.
Earn. from pass., mail and express	$93,884	$83,417	I. $10,467	13
Freight	336,326	321,307	I. 15,019	5
Gross earnings	$430,210	$404,724	I. $25,486	6
Expenses and taxes	262,477	218,419	I. 44,058	20
Net earnings	$167,733	$186,305	D. $18,572	10
P.c. of exps to gross earn	61	54		
Jan. 1 to Sept. 30:				
Earn. from pass., mail and express	$733,698	$583,082	I. $150,616	26
Freight	2,860,701	2,421,221	I. 439,480	18
Gross earnings	$3,594,397	$3,004,303	I. $590,096	20
Expenses and taxes	2,195,845	1,794,007	I. 401,838	22
Net earnings	$1,398,553	$1,210,296	I. $188,257	16
P.c. of exps. to gross earn	61	60		

The following is the revenue for the nine months:

Net earnings, nine months	$1,398,554	$1,210,296
Other Income:		
Interest, dividends, etc	107,148	75,020
Total	$1,505,702	$1,285,316
Fixed Charges:		
Interest on funded debt	$891,325	$849,937
Interest on car trust	61,103	63,005
Total interest charges	952,428	912,942
Surplus nine months	$553,274	$372,374

NORTHERN PACIFIC.

The approximate gross earnings of the company is as follows:

	1888.	1887.	Increase.
Miles—Main line and branches	3,397	3,082	315
Month of October	$2,218,894	$1,674,881	$544,013

LOUISVILLE & NASHVILLE.

The Louisville & Nashville earnings for September and the three months to Sept. 20 are as follows:

September:	1888.	1887.	Inc. or Dec.
Earnings	$1,384,834	$1,437,908	I. $43,074
Expenses	851,960	842,251	D. 9,709
Net	$542,874	$595,657	I. $52,783
July 1 to Sept. 30:			
Earnings	$4,074,193	$4,134,133	I. $59,940
Expenses	2,563,804	2,443,706	D. 120,098
Net	$1,510,389	$1,690,427	I. $180,038

WESTERN NEW YORK & PENNSYLVANIA.

The statement of earnings and expenses for the year ending Sept. 30 shows:

	1888.	1887.	Inc. or Dec.
Gross earnings	$3,061,565	$2,686,388	I. $375,177
Operating expenses	2,205,432	2,231,336	D. 25,903
Net earnings	$856,132	$455,052	I. $401,080

CAIRO, VINCENNES & CHICAGO.

Month of September:	1888.	1887.	Inc. or Dec.
Gross earnings	$66,211	$65,837	I. $374
Oper. exps. and taxes	38,075	38,917	D. 842
Net earnings	$28,136	$26,920	I. $1,216

CHICAGO, BURLINGTON & NORTHERN.

September:	1888.	1887.	Inc. or Dec.
Gross earnings	$195,792	$173,062	I. $22,630
Operating expenses	137,514	136,714	I. 800
Net earnings	$58,278	$36,348	I. $21,933
Nine Months—Jan. 1 to Sept. 30:			
Gross earnings	$1,355,937	$1,786,411	D. $430,474
Operating expenses	1,178,536	1,360,199	D. 181,663
Net earnings	$177,401	$426,212	D. $248,811

CENTRAL OF NEW JERSEY.

Month of September:	1888.	1887.	Increase.
Gross earnings	$1,328,212	$997,120	$331,092
Net earnings	710,718	401,469	299,249
Nine Months—Jan. 1 to Sept. 30:			
Gross earnings	$9,709,826	$8,515,839	$1,193,987
Net earnings	4,383,920	3,813,414	570,506

Earnings of railroad lines for various periods are reported as follows:

Month of September:	1888.	1887.	Inc. or Dec.	P.c.
Allegheny Valley	$188,021	$180,959	I. $7,062	3.9
Net	93,781	71,769	I. 22,012	30.7
Atchison, T. & S. F.	1,411,850	1,506,261	D. 94,411	6.2
Net	491,155	671,233	D. 180,078	26.8
Cairo, Vin. & Chic.	66,211	65,837	I. 374	.6
Net	28,136	26,920	I. 1,216	4.5
Canadian Pacific	1,130,947	1,063,207	I. 67,740	6.3
Net	358,652	377,967	D. 19,315	5.1
Cen. of New Jersey	1,328,212	997,120	I. 331,092	33.2
Net	700,718	401,469	I. 299,249	74.5
Cin., N. O. & Tex. P.	321,154	309,917	I. 11,237	3.6
Net	109,000	129,481	D. 20,481	15.8
N. O. & Northeast.	63,423	56,332	I. 7,091	12.5
Net	9,000	10,000	D. 1,000	10.0
Vick. & Mer.	28,833	51,939	D. 23,106	44.5
Net	2,000	16,000	D. 14,000	87.5
Vick., Sh. & Pac.	39,338	58,816	D. 19,478	33.1
Net	6,000	24,000	D. 18,000	75.0
Cleveland & Canton	34,559	36,192	D. 1,633	4.5
Net	11,837	13,261	D. 1,424	10.7
Cleve., Col., Cin. & Ind	783,563	809,823	D. 26,260	3.2
Net	330,290	347,008	D. 16,718	48.2
Den. & Rio G. W.	126,625	123,422	I. 3,203	2.6
Net	48,156	48,513	D. 357	.7
Louis. & Nashville	1,394,834	1,437,908	D. 43,074	2.9
Net	542,874	595,657	D. 52,783	8.8
Month of September:	1888.	1887.	Inc. or Dec.	P.c.
Mil., L. Sh. & West				
Net	135,692	131,801	I. 3,891	2.9
N. Y. C. & H. R.	3,366,100	3,438,555	D. 72,455	2.1
Norfolk & Western	430,210	404,724	I. 25,486	6.3
Net	167,733	186,305	D. 18,572	9.9
Northern Pacific	1,711,275	1,408,210	I. 303,065	21.5
Net	674,104	694,027	D. 19,923	2.8
Ohio & Mississipi	396,602	408,054	D. 11,452	2.8
Net	157,863	167,013	D. 9,150	5.5
†Ore. Imp. Co.	407,809	362,443	I. 45,366	12.5
Net	111,825	110,196	I. 1,629	1.4
†Ore. Ry. & Nav. Co.	609,450	487,246	I. 122,204	25.1
Net	286,450	227,959	I. 58,491	25.6
Pennsylvania	5,285,426	5,006,568	I. 278,858	5.6
Net	1,955,444	1,758,195	I. 197,249	11.2
Philadelphia & Erie	447,032	339,523	I. 107,509	31.6
Net	192,749	106,976	I. 85,773	80.1
Pitts. & Western	185,592	200,341	D. 14,749	7.4
Net	51,327	55,478	D. 4,151	7.5
Southern Pacific Co.:				
Gal., Har. & S. Ant.	320,495	295,097	I. 25,398	8.6
Net	100,490	83,217	I. 17,273	20.7
Louisiana West	83,298	72,936	I. 10,362	14.2
Net	42,857	40,162	I. 2,695	6.7
Morgan's La. & Tex	388,908	375,838	I. 13,070	3.4
Net	107,982	109,745	D. 1,763	1.6
N. Y., Tex. & Mex.	18,442	17,402	I. 1,040	6.0
Net	2,313	5,384	D. 3,071	56.8
Tex. & N. Orleans	125,590	109,993	I. 15,597	14.2
Net	38,601	54,166	D. 15,565	28.6
Tot. Atlan. System.	936,733	871,266	I. 65,467	7.5
Net	292,242	292,674	D. 432	.1
Union Pacific	2,067,905	2,743,980	D. 76,075	27.7
Net	1,050,153	1,377,948	D. 327,795	23.7
West N. Y. & Penn.	301,498	278,419	I. 23,079	8.3
Net	64,959	81,086	D. 16,127	19.9
W. Va. Cent. & Pitts	67,542	52,498	I. 15,044	28.6
Net	20,808	21,747	D. 939	4.3
Wisconsin Central	385,320			
Net	144,114			
Total (gross)	$20,364,644	$19,261,005	I. $1,103,639	5.7
Total (net)	7,757,256	7,812,882	D. 55,626	.7
Nine months—Jan. 1 to Sept. 30.				
Allegheny Valley	$1,515,685	$1,483,551	I. $32,134	2.2
Net	621,421	554,657	I. 66,764	12.0
Atchison, T. & S. F.	11,238,992	13,634,173	D. 2,395,181	17.5
Net	3,408,214	6,232,373	D. 2,824,159	45.3
Canadian Pacific	9,371,430	7,904,469	I. 1,466,961	18.5
Net	2,292,879	2,096,902	I. 195,977	9.3
Central of N. Jersey	9,709,826	8,515,839	I. 1,193,987	14.0
Net	4,383,920	3,813,414	I. 570,506	14.9
Cin., N. O. & Tex. P.	2,674,624	2,426,797	I. 247,827	10.2
Net	796,000	884,866	D. 88,866	10.0
N.O. & Northeast'n	595,120	462,249	I. 132,871	28.7
Net	55,000	46,000	I. 9,000	19.6
Vicks. & Meridian	314,861	364,254	D. 49,393	13.5
Net	22,000	24,000	D. 2,000	8.3
Vick., Shreve. & P.	357,115	369,763	D. 12,648	3.4
Net	54,000	56,000	D. 2,000	3.6
Cleveland & Canton	283,914	270,827	I. 13,087	4.8
Net	88,755	74,260	I. 14,495	19.5
Clev., Col., Cin. & In.	5,582,204	5,706,272	D. 184,068	3.2
Net	1,578,507	1,930,226	D. 351,719	18.2
Denv. & Rio Gr. W.	954,647	824,223	I. 130,424	15.8
Net	226,413	226,539	D. 126	.1
Louisv. & Nashville	11,810,136	11,552,010	I. 258,126	2.2
Net	4,082,277	4,494,939	D. 412,662	9.2
N. Y. C. & Hudson R.	36,132,920	35,297,056	I. 835,865	2.4
N. Y., Phil. & Nor.	482,533	389,607	I. 92,926	23.9
Net	135,367	73,445	I. 61,922	84.3
Norfolk & Western	3,594,399	3,004,303	I. 590,096	19.6
Net	1,398,555	1,210,296	I. 188,259	15.6
Northern Pacific	12,419,313	9,357,525	I. 3,061,788	32.6
Net	4,658,917	3,756,357	I. 902,560	24.0
Ohio & Mississippi	2,791,896	3,031,981	D. 240,085	7.9
Net	779,636	1,064,600	D. 284,964	26.7
†Ore. Improve. Co.	3,726,710	2,971,431	I. 755,279	25.4
Net	816,136	814,960	I. 1,176	.1
†Ore. Ry. & Nav. Co.	4,493,633	3,605,306	I. 888,327	24.6
Net	1,587,271	1,451,170	I. 136,101	9.3
Pennsylvania	43,356,976	41,053,674	I. 2,303,302	5.7
Net	14,396,035	14,123,655	I. 272,380	1.9
Philadelphia & Erie	3,262,519	2,971,951	I. 290,568	9.7
Net	1,330,456	1,196,970	I. 133,486	11.2
Pittsburgh & West	1,469,557	1,480,280	D. 10,723	.8
Net	356,071			
Scioto Valley	500,457	579,699	D. 79,242	13.7
Net	107,333	139,919	D. 32,586	23.2
So. Pacific Co.:				
Gal., Har. & S. Ant.	2,746,460	2,385,558	I. 360,902	15.1
Net	648,193	380,337	I. 267,856	70.4
Louisiana West	690,212	607,836	I. 82,376	13.5
Net	329,514	288,048	I. 41,466	14.4
Morgan's La. & T.	3,519,987	2,954,907	I. 565,080	18.8
Net	992,660	568,070	I. 324,590	57.1
N. Y., Tex. & Mex.	96,105	125,200	D. 29,095	23.2
Net	Def. 36,684	13,354	D. 50,038	
Tex. & New Or.	1,036,279	917,922	I. 118,357	12.9
Net	278,495	425,526	D. 147,031	34.5
Tot. Atlan. System.	8,089,040	6,991,421	I. 1,097,619	15.7
Net	2,212,176	1,675,336	I. 536,840	32.0
Union Pacific	21,292,905	20,781,843	I. 511,062	2.5
Net	8,121,994	8,444,252	D. 322,258	3.8
West N. Y. & Penn.	2,330,805	2,055,526	I. 275,279	13.4
Net	649,723	414,806	I. 234,917	56.6
W. Va. Cent. & Pitts.	465,370	269,676	I. 195,694	72.5
Net	148,982	90,231	I. 58,751	65.1
Total (gross)	$161,215,110	$150,068,370	I. 10,546,740	7.0
Total (net)	53,951,967	54,890,173	D. 938,206	1.7

† Estimate for September.

Month of October:				
Buff., Roch. & Pitts.	$191,338	$184,918	I. $6,420	3.4
Cario, Vin. & Ohio	70,126	74,546	D. 4,420	6.0
Lake Erie & Western	218,220	203,052	I. 15,168	7.5
Tol., Ann Ar. & N. M.	72,721	54,836	I. 17,885	32.6
Jan. 1 to Oct. 31:				
Lake Erie & Western	$1,779,103	$1,756,134	I. $22,970	1.4
Tol., Ann Ar. & N. M.	549,301	435,999	I. 113,302	26.0

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

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